

Supplement No. 1, to the Thirty-Fourth Annual Report of the Department of Marine and Fisheries

FISHERIES

SPECIAL REPORTS

ON

- I.—The Hatching and Planting of Trout.
- II.—The Planting of Predaceous Fish.
- III.—The Aim and Method of Fishery Legislation.

BY

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SPECIAL REPORTS

CONTENTS

I.—ON THE HATCHING AND PLANTING OF TROUT.

	PAGE.
Artificial spawning, method of	1, 2
Aeration of cans containing fry desirable.....	5
Best places to plant fry	6
Best age for parent trout	1
Blunders in handling fry	5
Changing water containing fry	5
Crowding fry in tanks to be avoided.....	3
Cans for shipping fry described.....	4
Dangers to avoid in planting fish	6
Dead eggs, removal of.....	3
Davy, Dr. experiments in freezing eggs.....	5
Eggs when 'eyed' very hardy... ..	4
Eggs more hardy than fry.....	4
Elasticity of fish eggs.....	2
Examination of waters necessary before stocking.. ..	1
Fish, when pulverised, good food for fry.....	3
Feeding fry	4
Female trout, manipulation of.....	2
Fertilizing fish eggs.....	2
Fry less hardy than eggs.....	4
Frost may kill eggs.....	4
Garlick, Dr. Theodatus on fry food.....	4
Gauze netting at outlet of tanks.....	3
Gentle treatment of fry desirable.....	5
Handling of newly deposited eggs.....	2
Heat injurious to fish.....	4
Ice necessary when shipping fry.....	4
Lake trout fry, where to plant	6
Light, excessive quantity of, injurious.....	3
Management of young fish	3
Minister of Marine and Fisheries issues permits to take trout or eggs.....	1
Number and size of eggs.....	1
Permit from Ottawa necessary to capture parent fish.....	1
Period of hatching trout greatly varies	3, 4
Placing fry in deep water.....	6
Process of artificial spawning described	2
Quantity of fry to carry in cans.....	5
Rapid planting of fry necessary.....	5
Rearing boxes to be blackened.....	3
Removal of dead eggs.....	3
Sediment in tanks is injurious	2
Seines only allowed under strict conditions.....	1
Size of eggs.....	1

	PAGE.
Spring water preferable for hatcheries.....	2
Temperature of water.....	2, 3
Time occupied in incubation and hatching.....	3
Two-year old parent trout are best.....	1
Water supply should be pure and unfailing.....	3
Whitefish fry, where to place them.....	6

II.—THE PROPAGATION AND PLANTING OF PREDACEOUS FISH.

Bass will exterminate brook trout.....	14, 15, 19
“ “ disperse widely.....	14
“ “ desirable as a fine game fish.....	15
“ “ defended from charges.....	15
Brice, Commissioner opposes European trout.....	12
Catfish in Britain of doubtful benefit.....	12
Close season, long, unnecessary for predaceous kind.....	10, 11, 12, 17
Canadian trout (<i>Salvelinus</i>) a success in Britain.....	1
Care necessary in transplanting fish.....	12
Carp, introduction of, a doubtful benefit.....	9, 12
“ a drug to Canadian fishermen.....	9
“ a serious injury to the Potomac R., U. S.....	9
Dangers in transplanting new species.....	10, 13, 17
Different conditions in various waters.....	13, 15
English trout not desirable in our waters.....	8, 12
Exeter, Marquis of, defends black bass.....	15
Food of trout.....	13
“ bass.....	15
“ pickerel or pike-perch.....	17
Fish replace each other in depleted waters.....	10, 11, 16, 17
Grayling killed off by trout.....	13
Herring of great lakes (a lesser whitefish) now valuable.....	10
“ “ coexist with pike.....	11
Harm done by injudicious planting.....	4, 5, 16, 17
House sparrow an evil on this continent.....	8
Injudicious planting.....	7, 8, 17
Knowledge essential in introducing new species.....	9, 12, 16, 18
Lake-trout coexist with whitefish.....	10, 17
“ replace whitefish, Georgian Bay.....	10
Maskinonge is a dangerous species.....	15
Minnows in plenty essential for black bass.....	
New Zealand, English trout in.....	7
Perch, amazing increase of, after planting.....	17, 17
“ cannot be reduced in numbers.....	16
“ valued for sport.....	18
“ over-run Lakes Erie and Memphramagog.....	16, 17
“ destroy a trout lake.....	16
Pike suitable only for inferior waters.....	16
“ killed off Scottish trout and salmon.....	17
Pickerel or Dore very destructive.....	16, 17
Pacific trout undesirable in eastern waters.....	13, 14
Pike-perch supplant whitefish in Lake Erie.....	
Predaceous fish over-run waters.....	8, 16
“ “ are an evil.....	16, 17
“ “ not cultivated in Canada.....	10
“ catfish.....	16

SESSIONAL PAPER No. 22b

	PAGE.
Potomac River, carp killed off bass in.....	9
Pike and black bass coexist in same waters	19
Rainbow trout, a fine game fish.....	14
" " undesirable in Eastern Canada.	14
" " not preferable to brook trout.....	14
Rabbit plague in Australia.....	8, 9
Sturgeon, evil repute of.....	18, 19
" not a spawn destroyer.	18
" worth protecting.....	19
" difficult to hatch.....	19
Salmon v. trout in rivers.....	12, 13
Salmon, English, a failure in New Zealand.....	7
Shad, a success when introduced into Pacific waters.....	7
Suckers.....	13, 16
Strong species overcome the weaker native fish.....	8, 10, 15, 17
Trout not desirable in western lakes.....	13
" English flourish in New Zealand.....	7
" dwarfed in Loch Ard, Scotland.....	8
" proposal to destroy by dynamite.....	12
" Brook, preferable in Eastern Canada.....	14
" " food of.....	13
" " killed off grayling	13
" " are cannibals.....	13
" may be preferable to salmon.....	13
" destroyed by bass.....	14, 15
Valuable commercial fish only, hatched in Canada.....	13, 17
Whitefish stated to be predaceous in Lake Winnipeg.....	10
" require special protection.....	10, 11
" of chief value in western Canada.....	12, 13, 19

III.—THE AIM AND METHOD OF FISHERY LEGISLATION.

Agents and buyers of fish in conflict with fishermen	25
Anglers, takes of fish limited by law.....	27
Anglers often oppose fishermen's interests.....	25
Areas set apart for fish propagation.....	26
Bare hooks (grapnels) for sturgeon prohibited.....	27
Basis of all fishery legislation is the public good.....	21, 22
" " " fourfold.....	24
British Columbia yielded exceptional fisheries revenue.....	21
" canners volunteered increased fee payments.....	21, 29
Brand, herring, in Scotland benefits industry.....	28
" or stamp on Canadian lobsters ensures legality.....	28
Bounty paid to fishermen in Canada how raised and administered.....	21
Canners' interests in B.C. protected by law.....	27, 28
Canners in B.C. granted net licenses.....	27, 28
" of fish often in conflict with fishermen.....	25
Channels of rivers not to be obstructed.....	27
Class interests raise conflicts amongst fishermen.....	22, 24, 25
Close times, weekly.....	25
" diurnal	25
" seasonal	25
Canadian fishery laws not designed for revenue purposes.....	20, 21
Commercial interests often oppose fishermen's views.....	25
Confusion arises from divided Dominion and Provincial authority in fishery matters.....	22, 23, 24
Compromises frequent in international fishery disputes	24
Crown represented by Provinces as well as Dominion.....	22

	PAGE.
Curing of fish raises or lowers market value of fish.....	29
Customs regulations overlap fishery laws.....	28
Dominion has jurisdiction over but not 'property' in fisheries generally.....	20, 21, 23
" can impose a tax on Provincial licenses.....	21
Evidence of fishermen before Commissioners very reserved.....	20
Fish, interests of, prominent in fishery laws.....	24
Fishermen often narrow in their views.....	22
" adopt same policy as hunters.....	22
" often oppose each others' interests.....	22, 24
Fishery laws in all countries a gradual growth.....	20
" in Canada not designedly a means of securing revenue.....	20, 21
" should be based on accurate knowledge.....	23
Fragments of lobsters cannot be legally sold.....	26
Fresh water fisheries, tendency to increase restrictions in.....	20
Fisheries of Canada, all have an interest in.....	21, 22
Fishways to be provided where judged necessary.....	27
Fourfold basis of fishery legislation.....	24
Gurry, or fish-offal, not to pollute waters.....	28
Ice, fishing prohibited through, for trout and oysters.....	27
Industries, numerous, depend on fisheries.....	24
International interests in fishery legislation.....	24
Interests of fishermen guarded by law.....	24, 27
" " fish " " " ".....	24, 25
" " nations " " " ".....	24
" " state as a whole " " " ".....	21, 22, 24
" " various fishing classes opposed.....	24, 25
Irrigation ditches in North-west Canada must have guards.....	27
Knowledge necessary on which to base just laws.....	23
Lawful excuse regarding waste of fish.....	26, 27
Laws, fishery, are fourfold in their object.....	24
Legislative supremacy vested in Dominion.....	23
Leases, fishery, referred to.....	26
License fees (Federal) usually nominal.....	20, 21
License system a regulative lever without penalties.....	23
" " affords effective control.....	21
Lobster size limit in Bay of Fundy waters decided by market.....	25
" trap regulation to permit small ones to escape.....	25
" gear not to be set before season opens.....	28
" stamp or brand guarantees quality.....	28
Meat, broken lobster, not legally saleable.....	26
Mesh of nets specified in certain regulations.....	25
Manure, use of fish for, prohibited.....	26, 27
Manufacturers, (fish products) included in Fishery Laws.....	29
Misunderstanding regarding Fishery Laws.....	20
Migration of fish facilitated by law.....	24, 27
Moral suasion effective in fishery protection.....	23
Nets, distance between, legally specified.....	27
" length of.....	27
" of certain kinds prohibited.....	26, 27
National interests in fisheries conserved.....	21, 24
Norwegian dried cod brings best prices.....	29
Obstacles to fish-migration illegal.....	24, 27
Overfishing prevented by law.....	27
" by steam tug not allowed.....	27
Offal prohibition.....	28
Oyster minimum legal size of.....	25
" dredges forbidden.....	26

SESSIONAL PAPER No. 22b

	PAGE.
Precautionary regulations	28
Permits to allow taking fish for scientific purposes	26
Pollutions in rivers, &c	23, 28
Propagation of fish by legal reserves	26
Provinces in Canada have property in fish	21
" " exact increased revenue since 1898	21
Preparing to fish forbidden in certain cases	28
Public interest in fisheries must be paramount	24
Pike of value as food in western Canada	26
" not protected in eastern Canada	26
Prohibition may be restorative, preventive and restrictive	26
Resentment at fishery laws unjustifiable	20
Stocking of waters privately, illegal unless by permit	25
State has interest in preserving fishery resources	22
Scottish law, early on fisheries.	23
Screens required for ditches in B.C., and N.W.T.	27
Sea fisheries, tendency to remove restrictions	20
Spawning fish not to be taken ...	27
Sea coast residents not more interested in fisheries than others	22
Size limit for fish	25
" lobsters	25
" oysters	25
Speculative fishing discountenanced.	26
Spears prohibited	26
Sturgeon not to be taken with bare hooks	27
Tidal parts of rivers, fishing in, of common right	22
Unwritten law effective in fisheries	23
Universal prohibitions (dynamite, spears, &c.)	26
Voracious and useless fish have no close seasons. ...	26
War imminent at times in fishery disputes	24
Waste of fish prohibited	26, 27

SPECIAL REPORTS.

No. I.—ON THE HATCHING AND PLANTING OF TROUT.

BY PROFESSOR EDWARD E. PRINCE, COMMISSIONER AND GENERAL INSPECTOR OF FISHERIES FOR CANADA.

In the hatching of trout and salmon, whose ova are comparatively large and heavy, it is usual to place the eggs in shallow perforated trays over which pure fresh water passes during the period of incubation. If the eggs are loosely spread so that they do not unduly press upon each other, and if frost, excess of light, deleterious chemical or other influences are guarded against, the process of artificial hatching can be accomplished with facility. More than thirty years ago the Commissioner of Irish Fisheries hatched a quantity of salmon by a simple incubating apparatus in his office in the Customs House, Dublin—a clear proof that the obstacles to success are not serious.

Before commencing artificial fish-culture for the purpose of stocking any waters, it is necessary to prove as a first step that the waters are suitable. Even streams and lakes, which once abounded with trout, may, during the process of depletion, have become altered in character, and no longer possess their former favourable features. A few adult trout transplanted from other waters will in a single season afford the required information. If the fish survive and flourish, there need be no fear of success. Such information is especially necessary in the case of artificial ponds or of waters which it is proposed to stock for the first time. Under conditions which are really unfavourable speckled trout will, of course, live, but not in a healthy, vigorous state. They will even survive in shallow stagnant water, where the supply is small and uncertain, but very different conditions are necessary for successful trout-culture.

If it is intended to hatch and rear trout from the egg, the parent fish must be secured before the close season begins and retained in a pond until ripe, otherwise trout can only be secured by obtaining from the Minister of Marine and Fisheries a special permit, the conditions attached to which are very stringent. Trout, when two years old, will yield spawn, but as the number of eggs yielded by them is small, and the eggs have been proved to be less hardy than those of older fish, it is preferable to select parent fish not younger than four years and not older than twelve years. Moreover, the larger fish furnish a greater number of eggs, the amount being about 900 for every pound weight of the parent, and the eggs themselves are of larger size. A salmon produces eggs at least one-third larger than those of a small grilse, and the fry hatched from eggs of large size have been found to be finer, healthier, and of more rapid growth than from smaller eggs. This is as true also of trout. The spawning season extends over a long period, and individuals containing ripe eggs may be found from late fall until spring. It is not necessary to describe the methods of obtaining parent trout, though the drag seine of 1-in. bar, *i. e.*, about 2-in. extension mesh, is very effective. The seine being an excessively destructive net is generally discouraged in Canadian waters, however, and it must not be forgotten that the barring of small streams frequented by trout and other fish is forbidden by law.

The requisite number of parent trout having been obtained and confined in a small pond ready for artificial spawning, it is necessary for at least two operators to assist in the work, one to perform the "stripping," the other to net the fish, as required and hand the vessels, &c., to the operator. Kneeling on the ground the operator firmly but gently lifts a fish by the tail out of the landing net, using his left hand and rests its head for a moment on a towel, lightly passing his right hand towards the throat and grasping it with the open thumb and forefinger under the breast fins, the other three

fingers of the right hand being pressed upon the left gill-cover of the fish. The back of the fish is pressed against the right breast of the operator and the tail bent back and upward. If the fish is fully ripe, the ripe eggs will shoot out in a continuous stream and the assistant completes the operation by gently pressing upon the under side of the fish and passing his hand from the head towards the tail to expel the eggs that may not have run out. The eggs should not fall far, so that the assistant should hold or place on the left of the operator the shallow dish, which is to receive the eggs. No force is necessary. If the eggs refuse to stream out, the fish is most probably not fully ripe, and a little patience will prove that. Some fish refuse for a minute or two to yield their spawn, and old fish always spawn less freely than young examples. Some manipulators wrap the fish in a towel, leaving the snout and hind part of the body free, others hold the fish's head or shoulders in the left hand, and grasp the under side of the body with the right hand, holding the tail down and slightly pressing with the right thumb. There are disadvantages connected with these methods; but in all alike patience and gentle handling are essential. The fish should not be unduly disturbed or roughly treated, and spawning can thus be accomplished without the slightest possibility of injury. Very large and strong fish may demand the united efforts of two operators. When four or five female fish have been spawned into the plate yielding, say, 10,000 ova, the assistant must then land in succession two or three ripe males. Each fish should be brought close to the eggs as they lie in the plate, and as soon as the abdomen touches the eggs a large flow of creamy milt will be forcibly ejected. The plate should be turned round as each new male is brought so that all the eggs may receive a share of the fluid milt. A slight pressure of the right thumb and finger behind the breast fins and further back will increase the flow. The milt of a single male will suffice for an extraordinary number of eggs if both sexes be in fully ripe condition, and in case of necessity one male may with confidence be used to fertilize the ova of five or six females; but where possible the first named proportion is safest. The vivifying or fertilization of the egg will be aided by gently stirring them with a clean feather after milting, and adding half a pint of water to dilute the creamy milt. Each dish when thus filled and stirred should be placed on one side and five more females spawned into another dish. In half an hour they should be transferred to a larger vessel, a clean wooden bucket, and placed under a gentle flow of clean water, to wash all impurities and excess of milt away. The eggs will appear no longer soft and yielding, and instead of clinging together will be hard to the touch and separate from each other. They are very elastic and will endure great pressure. Thus Frank Buckland, the most famous of English pisciculturists placed upon some trout eggs a weight not less than five pounds six ounces before he could crush them. Nevertheless pressure especially upon newly fertilized eggs is highly injurious.

It is necessary to place the eggs, after being cleaned, upon the hatching trays. These consist of lightly made square frames of wood, across which is stretched japanned wire cloth, though in the Government hatcheries perforated tinned trays, black japanned, have been found advantageous.

The following five conditions are necessary for successful hatching :—

- (1) A supply of water which is regular and unfailing.
- (2) Water of even temperature, that supplied from a spring at some depth beneath the ground is preferable.
- (3) Freedom from impurities and sediment, which suffocate the eggs, hence the supply of water should run into a tank to allow sediment to settle before it runs over the hatching trays.
- (4) The quantity desirable is about 100 gallons per hour for 10,000 eggs. The greater the quantity of water the better, as eggs actually breathe water and need ample supplies of oxygen which the fresh inflow of water contains.
- (5) Protection from floods by means of guards and an overflow ditch higher up than the supply pipe. While spring water from its equable temperature, purity and other features is always preferable, yet when incubation has advanced to what is called the eyed-egg stage, water from a brook or river will serve quite well.

Trout eggs hatch out in from 50 to 150 days, according to the temperature, amount, and rapidity, as well as the character, of the water. Water from limestone

SESSIONAL PAPER No. 22b

strata is generally held to be best, and the greater the quantity of water the longer can incubation be protracted. Temperature is of course most potent, and a change of one degree Fahr. rise or fall, shortens or lengthens the process of incubation four or five days. Eggs of trout which hatch out in 50 days when the temperature of the water is kept at 50° Fahr., will take 100 days if the temperature is kept as low as 40°. The filled hatching trays are placed in wooden tanks open at the top, and a flow of water through the boxes must be arranged to ensure two inches or less of water over the eggs. Direct light should be excluded to discourage fungus growth. Dead eggs should be picked out each day. When eggs die they lose their delicate transparency and bloom, and assume a dead white appearance, and unless removed a feathery fungus rapidly covers the egg, and spreads to other healthy eggs. Hence the necessity for promptly removing them. If eggs require moving on the tray it should be done gently with a soft camel-hair pencil or brush. They may be softly swept into a spoon when it is desired to remove a few from the tray. A tray may be emptied by lifting it out of the water and skilfully overturning it into a dish. Eggs must never be touched by the hand, and dead eggs are best removed with wooden pincers or forceps.

Hatching and rearing boxes require to be blackened inside. Charring is much to be preferred to black varnish. Black paint must be avoided. Hot blocks of iron 20 lbs. or 28 lbs. weight are closely applied to the surface to be charred and this close contact prevents burning. All boxes, trays, &c., after charring, varnishing, &c., must be well seasoned in water some time before hatching operations begin.

When the delicate young fry, called "alevins," begin to hatch they do so in such numbers that special tanks are necessary to which to transfer them. Many of the fry cannot free themselves from the egg-shell or capsule, and require a little skilful help by means of an artist's camel-hair brush. When not more than two hours old the little fish have intelligence enough to dart away from danger. It requires some agility to capture one with a spoon. A scoop of fine gauze or perforated zinc is effective.

The following points may be noted in connection with managing the fry :—

(1) They should be exposed to very little light.

(2) No food is required until the large bag of yolk attached to each alevin is almost absorbed.

(3) Prevent massing together, their jelly-like bodies when crowded together result in suffocation and death.

(4) Cover the exit with fine gauze to prevent the tail and yolk-sac of some of the fry passing through, and occasionally sweep them gently away from the point of outflow.

Before the yolk is gone, trout fry will pick up minute particles of food, and, indeed, if fry are kept more than six or seven weeks, systematic feeding must be resorted to. At the Restigouche hatchery, Mr. Alex. Mowat was granted permission in 1899 to retain and rear 10,000 sea salmon fry until they were six months old, when many of them reached three inches in length. This very successful attempt is referred to in the report by the officer named (*See Department's Report for that year, Appendix 11, Fish-Culture Operations*) from which I quote the following :—

As regards the 10,000 fry retained at the hatchery in open air tanks until six months old, the experiment was most successful. Many of these little fish were fully 3 inches in length when liberated in the autumn. The food for the fry consists of pulverized liver and raw fish, the fish only being used as a fluid food, and the liver grated into powder. A great amount of attention and care must attend the work of feeding the fry, and keeping all dead and decayed matter removed from the tanks. I am confident that from the trial made during the past summer at the Dee Side hatchery, that large numbers of the fry can be fed and reared in the tanks for at least six months before being liberated.

The utility of using other fish, in a powdered or mashed state for the sustenance of advanced fry was suggested long ago by that pioneer in fish-culture on this continent, Dr. Theodatus Garlick, of Cleveland, Ohio, U.S.A.* Dr. Garlick, in his interesting little 'Treatise on the Artificial Propagation of Certain Kinds of Fish' published in 1857,

* *Vide* my paper on "Fish-Culture in Canada" Transact. Ottawa Lit. and Sci. Soc., Part II., p. 164.

1-2 EDWARD VII., A. 1902

said (p. 89.): It has been ascertained that the lean flesh of animals, when boiled, is an excellent article of food for young fish, or even old ones. As the fish are very small, it is necessary to hash it up into very fine particles or they will swallow it; in fact, it should be pounded or grated very fine, but as they increase in size, it may be given in coarser particles. The flesh of other kinds of fishes, where they are plenty, would be an excellent substitute for the flesh of animals, either cooked or uncooked; I think this kind of food preferable to any other.

The question has often been discussed whether fry whose incubation has been protracted are stronger than those which have been hatched earlier under a higher temperature. Certainly the mortality in broods of English trout hatched in water below 40° F. is far less than when the water is of a higher temperature. The same has been found to be true of the Canadian speckled trout and the Rainbow trout.

In a series of ova which had reached an advanced stage in water of 48° F., and were then placed in trays supplied with water 10° lower, the hatching out did not take place until the 120th day, though they are known to hatch in 50 or 60 days under a higher temperature. The resulting fry are more robust, and fewer die during the early stages after liberation from the egg than in those hatched at a temperature of 48° to 60°. Actual tests on spawning beds have shown that for long periods the water may not rise above 34° or 35° until April, and the period of hatching is therefore prolonged to 150 or 160 days, with the result that the fry are stronger and more healthy.

In accordance with the conditions which obtain in nature, the fry, after exclusion from the egg, should not be subjected to very low temperatures, but water ranging from 45° to 55° is most suitable. The carrying of fry to the localities where they are to be deposited is an important matter. Railway journeys, if not too protracted, do little harm to fry, unless the cans or tanks holding them are kept too near a stove or hot pipes. Excessive heat often proves fatal in railway cars, but as a rule, journeys by rail are less perilous than by team over rough roads, when the shocks and collisions seriously disarrange the delicate organization of the young fry, and damage it is believed the sensitive otocysts of the little fish. Team-drives over rough trails through forests are not conducive to the well-being of fry, and when possible, cans should be carried, in the manner described later, over very rocky or uneven tracts. Conveyance by boat or canoe is by far the best mode. Cans specially contrived for the purpose are best, and should be made of heavy galvanized iron† or stout iron well tinned, and holding 10 to 12 gallons of water. They may be 24 or 26 inches high, and say 18 inches in diameter, but may be of the form of a truncated cone, with a narrow neck in the centre for the purpose of preventing the splashing and loss of water as far as possible. Into the neck (say 6 inches in diameter), a cylindrical can fits, the bottom of which is made of fine metal gauze. The gauze not only allows of aëration, but when necessary serves as a receptacle for pieces of ice, which, melting, trickles into the water below in which the fish are swimming about. The ice is often broken up into fine pieces or crushed, if it does not melt and cool the water properly. It should always be remembered that the young fishes, above all salmonoid fishes, cannot endure heat, nor are they able to withstand frost with impunity. Indeed, ice placed in the lid of the can or tank has proved harmful when on warm days the fry have been surrounded for some hours by water of 50° or 60°. Hence the advisability of transporting young fish either in the early spring months or during the night, and at early morning when the season is warmer and more advanced. At such times they can be most safely shipped.

It is well known that newly hatched fish are far less hardy than eggs. But even eggs during the first few weeks are very sensitive, and within three weeks after fertilization they should be subjected as little as possible to concussions and rough usage. Salmon eggs 22 days old died in 8 or 9 days after being roughly handled during some experiments by the late Dr. Francis Day, the well known British salmon authority, but after the 47th day only very hurtful causes, such as chemical impurities, &c., will do them any harm, and "eyed" eggs are hardy in the extreme. No doubt vast numbers of ova are lost every year at the head waters of salmon rivers by being frozen.

† While galvanized iron is the best material, it must be remembered that the spirits of salt, used in soldering is very hurtful, and new cans, should stand full of water (often renewed) for eight or nine weeks.

SESSIONAL PAPER No. 22b

Certainly in 1881, this loss was very severe on many Scottish rivers. The famous physiologist, Dr. Davy, brother of Sir Humphrey Davy, imbedded salmon eggs in ice, and found that they survived ; but his experiments provided conditions probably more gradual than the severe and trying circumstances of freezing near the source of a river.

In order to keep the cans suitably cool an outside jacket of iron is often provided, separated by an empty space from the inside can containing the fry. Such double cans are very effective, and being much cooler than ordinary cans, the fry are shipped in them with much greater safety and success. Whitefish fry which are very small and delicate will to the number of 15,000 to 25,000, travel in one of these cans without loss if the journey be not long and trying : but half that quantity of brook trout and salmon would as a rule suffice. Some authorities favour the wise principle of putting a minimum quantity of fry in each can and regard 3,000 to 5,000 as ample, but with newly hatched fry before the gills are properly developed, and before they have acquired their full larval activity and vigour, a greater number can be safely shipped in each can. Ten cans is a full shipment for one team, and fewer cans are in most cases advisable. At the famous Howietoun fish-ponds in Scotland, the lamented Sir James Gibson Maitland, whose recent death all interested in fish culture must deplore, used a conical form of can 24 inches in diameter across the bottom, and $4\frac{1}{2}$ inches in diameter at the top. The height of this can is 32 inches, and the weight, when filled, about 170 pounds, so that two men could easily lift it about by means of two strong handles fixed at points a little above the centre of gravity (about 14 inches from the bottom). When it is necessary to convey the cans along forest paths or across rocky hills, two poles are horizontally attached to the handles, and the can is then easily carried—one man walking in front and the other behind. Many Scottish lakes situated on the highest altitudes have been successfully stocked by this method.

All fry should be planted immediately after arrival. If the hour of arrival at the planting ground be midnight or during the small hours of the morning so much the better, the atmosphere is then cool. In any case no time should be lost as every moment is of importance, and the sooner the fry are disporting themselves in the clear waters of the stream or creek, the greater is the assurance of success. Under no plea whatever should fry be kept in the cans over the night. Great risk is run by a few hours' delay. If through the impossibility of obtaining a team or other cause it is absolutely impracticable to at once plant them, they should be constantly watched and fresh water splashed in, or the water aerated by a bellows or other means. Aeration is most easily and effectively done by lifting up water in a dipper from the can and letting it fall again with a splash : but on no account should the device be adopted of blowing down a tube into the can with a view to aerating the water. Such an absurd plan has been actually adopted by some manipulators : but in blowing down poisonous air from the lungs, the water in the can already vitiated with carbonic acid gas, becomes more vitiated and poisonous. The surest way of killing and asphyxiating fish suffering from lack of oxygen is to blow air from the mouth into their midst.

Again, fry should not be unduly knocked about or the cans roughly handled. 'Fry will not stand much knocking about,' wrote the late Sir Gibson Maitland 'the bottom of a tank (or can) used for transporting fry should be stiffened by cross pieces soldered underneath, as, if it sags at all, the fry soon get fatigued, possibly because the least spring from the bottom frightens them and they exhaust their strength by frequent and aimless sallies through the water.' The same author also wrote : 'With care fry can be carried for twenty-four hours, but the result is not satisfactory if the journey be longer.'

Of course small quantities of fry can be sent further and more easily than large. The re-aeration of the water is a difficulty. It cannot be done automatically, as is the case with yearlings, because the motion the water acquires tires out the fry if very young. The cans should never be filled quite to the top : but a considerable space should be left or the fry will suffocate.

Bread crumbs or particles of such supposed food should never be scattered amongst young fish, when being shipped. Very bad results have followed when this has been done as bread is a most unnatural food for young fishes.

1-2 EDWARD VII., A. 1902

It usually suffices in a long journey to change the water at appropriate intervals. The fact is well known that little salmon and trout, only 2 or 3 weeks old, actively wave their pectoral fins to and fro and thus create a current of water which aids in oxygenation, and facilitates the breathing operations of the fish.

The actual planting of the fry is a most important matter, and a good deal of very inappropriate advice has been published upon this matter.

It is clear that fry should not be suddenly transferred from a warm can to a can of water that is several degrees higher in temperature than the lake or stream.

The temperature should be somewhat equalized by mingling the two waters before the fish are emptied out. The temperature of the water into which the fry are to be transferred should not be more than 6° higher or lower than the water in which they have been carried from the hatchery.

It is hardly necessary to say that if fry are being sent some distance to be planted, it is an advantage to have all arrangements for their reception made beforehand, so that teams may be waiting the arrival of the cans and an immediate start be made. Before placing the cans on the team it is advisable to remove the ice from the covers of the cans unless the outside atmosphere be very warm. Cans of fish should never stand in the hot rays of the sun: but a cover or sheet should be so placed as to shield them. Cans should also be thoroughly rinsed and cooled with water before fry are placed in them. Fish frequently become sick before leaving the hatchery because this rule has not been observed and the fry placed in cans which have been warmed by the sun or nearness to a stove.

It is a good principle to find out where the fish naturally spawn in the waters to be planted, or if no fish of the same species occur, to ascertain where the best natural conditions exist. Thus whitefish should always be planted on clean gravelly ground in fairly shallow water, or where reefs of honeycomb rocks extend. Brook trout and salmon should be placed near the head of streams or as far up tributaries of large rivers as possible, avoiding, however, those which dry up during the summer.

Lake trout do best if distributed over rocky shoals such as are selected by the parent fish. In such places as those specified there is abundance of shelter, and the small fish, as a rule, make at once for niches in the rocks, or the protection of pebbles and stones. As pike, pickerel and other predacious fish are in the spring occupied in spawning, there is less danger from these fish than is commonly supposed, especially as the first-named species are then in weedy, marshy localities engaged in depositing their eggs. If sunfish, shiners, small suckers and pike appear to abound, it is best to select some other areas which are free from these destructive pests, or if that is not possible, drive these fish away by disturbing the water, sweeping a net over the ground or some such method.

It is often the case that neither time nor circumstances will admit of reaching the best and most appropriate localities, and the planting must be done where it is apparent the young fry would not have been under natural conditions found. After much experience with young fry, I am bound to confess that planting fry upon what may not appear the most suitable grounds results in better success than might have been anticipated. The charge often made against officials of merely dumping in the fry at the most convenient rather than the most suitable places is less grave than might be imagined by the inexperienced. A man standing on shore, with one foot encased in a fisherman's boot, in the water, can pour the fry gently into a deep part near the edge, and the fry will immediately seek shelter. A better plan is to gently empty the fry from a boat and the fry disperse before they reach the bottom. For a few minutes the mass of young fish appear to crowd together and then spread themselves and disappear from sight. That they survive and do well admits of no doubt as the remark, already made, applies in this case, viz., that the chief enemies of the young fish are in swampy shallows engaged in depositing their spawn. In thus favouring the planting of fry in deep water when it is a matter of difficulty to plant them in small batches in shallow water, I have the support of the late Sir Gibson Maitland who wrote: 'At first we used to place the fry in the shallowest water near the inlet of the ponds; but they were so frightened that they used to be huddled together in masses when poured into deep water they instantly disperse, and in a few minutes have spread all over the pond in a lively and inquisitive spirit.'

No. II.—THE PROPAGATION AND PLANTING OF PREDACEOUS FISH.

BY PROFESSOR E. E. PRINCE, COMMISSIONER OF FISHERIES, OTTAWA.

The science of artificial fish-culture primarily confined its operations to restocking depleted waters. Salmon rivers were planted with salmon, trout-streams were restocked with trout, and the Great Lakes were re-populated with the young of the lake white-fish. There appeared to be some guarantee that the fry distributed from the hatcheries would have every chance of survival, because they were placed in waters where the conditions were appropriate. They were, in other words, planted in the waters to which they were native, and where their food and environment would be favourable and normal. It was not long before enterprising fish-culturists ventured to advance beyond these narrow limits. It was suggested that young fish might be introduced into waters to which they were not indigenous, and curiously enough some of the earliest experiments in the transplanting of fish were the boldest, and apparently the most hazardous to attempt. Trout and salmon from British waters were, in fact, sent to the Antipodes. No trout or salmon occurred originally in the rivers and lakes of Australia or of New Zealand, and not a few fish-authorities regarded as perilous if not hopeless, the proposal to place the brown trout of England, and the salmon of North Britain, in the waters of the southern hemisphere. Nearly forty years have passed since these initial shipments of British fish took place and the results are well known. The salmon for some reason appear to have failed to establish themselves, and the theory is that, if the young fish survived after being distributed, they went down to the sea as smolts and never returned. With the trout it proved wholly different, and the success of the experiment exceeded the most sanguine expectations. A great proportion of the fish descended to the sea and became sea-trout, but sea-trout far surpassing their brethren of the northern hemisphere. The British brook or river-trout ranges in weight from a few ounces to two or more pounds. Larger fish are recorded, but they are abnormal. Sea-trout reach a somewhat larger size, and on an average may be double the weight of their fresh-water congeners. But in Antipodean waters the progeny of the small English trout planted in the 'sixties' have grown to gigantic proportions, and huge specimens have been repeatedly captured approaching a weight of thirty pounds. The transplantation of fish from their native surroundings to waters entirely new to them was not only a successful experiment, it was a triumph in the history of artificial fish-culture. To this successful trial may be compared the introduction of the brook trout or North American char of Canada and the United States into English and Scotch waters where it has also turned out well. The gaily tinted *Salvelinus fontinalis* is now a familiar fish to British anglers and fish-culturists. The species has suffered no deterioration by being transported to waters across the Atlantic. Other cases might be referred to. Thus Pacific species of various kinds have been transferred to the Atlantic slope, and every effort made to establish them there, while on the other hand, extensive shipments of Eastern species have been made to Western lakes and rivers, both in the United States and in Canada. The experiment of planting Pacific salmon in rivers debouching into the Atlantic has not been demonstrated to have been a success. Stray specimens of salmon have, it is true, been captured in eastern rivers: but no marked results have been recorded. Atlantic shad, striped bass, river catfish, &c., planted in western waters on this continent have, however, prospered, and there is every sign that the step taken will prove eminently successful.

While artificial transplantation of fish proves in most cases not only a success; but a very real benefit to the territories whose waters may be stocked with new and useful varieties, yet there are dangers, and very real ones, which cannot be ignored, and unless some regard be had to the safe limits, within which this branch of fish-culture may be beneficially carried on, more harm than good may be done, and evils created which it will be well-nigh impossible to counteract and remove. This warning is specially

urgent and necessary in the case of predaceous species. As a rule such fishes are sturdy active and wandering kinds, well armed both as to spinous fins and formidable teeth and, in the contest with species less pugnacious and strong, they readily gain the upper hand, when introduced into new surroundings. Under normal conditions in their native waters, they are kept in check, or in most cases they do not frequent precisely the same areas as the more defenceless kinds. But if the balance of things be unduly disturbed, such rapacious species even in their native waters, will be found to unduly increase, and may over-run vast areas to the injury and, it may be, extermination of less predaceous and usually more valuable fish. On the other hand a species of fish may be introduced into a new habitat, which may be unfavourable for its growth and numerical increase, if not actually inimical to its very existence. This is not realized by many persons, who are filled with enthusiasm to have all available waters stocked without regard to the essential conditions of success. The experience of all fish-culturists, especially government experts, confirms this. A distinguished U.S. expert, lately deceased, once plainly stated his experience as follows: "I have seen very many applications asking for brook, brown and rainbow trout fry and brook, brown, and rainbow trout fingerlings, all on the same application and all desired for the same stream or pond. The eternal fitness of things is not in the least considered. A man is advised not to plant brown trout in waters already containing the native brook trout, and he replies that he has already done so. I think I can point to fifty cases of this sort. There will come a time when some one must answer for the indiscriminate stocking that has been done. That a man asks for a certain kind of fish for certain waters that are entirely unsuitable for the fish, is no reason why the man should have them merely because he is a citizen and a taxpayer and the fish are free. A chemist would not sell a man active poison simply because the man was ignorant of the results from using it and had been impressed with the name and so fancied it for his system, but an honest chemist would recommend horehound candy instead of the prussic acid the man thought he wanted. The Commission has a letter on file from a man whose application was not filled. He said he was entitled to the fish and would have them or know the reason why, with other intemperate language. He was told the reason why—that no man was entitled to any fish until his application had been passed upon by the Commission, then if the waters were suitable for the fish and the state had them for distribution, the fish were sent, not to the individual, but for the benefit of the general public who fished the water."

In unsuitable places where the fish do not actually perish, they may be dwarfed and lead a lingering existence. When in 1882 a quantity of the famous Loch Leven trout were transferred from their native lake, on the borders of Fife and Kinross, in Scotland, to the beautiful Highland loch, Loch Ard, by the Scottish Trout Preservation Association, it was found three years later by Mr. D. B. Macgregor, of Glasgow, that specimens were being caught, but their weight was not more than five ounces, whereas this species of trout normally reach double that weight, or even twelve or fourteen ounces in the favourable waters of Loch Leven. Mr. Macgregor in reporting on the matter attributed the dwarfing influence in Loch Ard, to the scarcity, or the difference in kind, of the food. Of course, it is impossible to foresee what results may follow the introduction into new waters of a strange or a foreign species. The acclimatization of animals (beasts, birds, and fishes) has yielded most unexpected results in many cases. The rabbit-plague in Australia, and Cape Colony, South Africa, for instance, the enormous increase of the European house-sparrow in North America, and the results (most harmful) of the liberation of English starlings in certain portions of the United States Republic, afford sufficient warning as to the unwisdom and riskiness, not to say widespread harm of the transplanting of species of living creatures from their native surroundings into new areas, without adequate knowledge or experience of the possible results. Some countries, alive to their best interests have taken effective steps to undo and counteract the evil; but preventive and corrective measure should be adopted in our own and other lands. The action of Cape Colony and Western Australia on the question stands out in marked contrast to the apathy of other countries. Cape Colony, in 1890, made it unlawful to introduce rabbits, either by land or sea, or to turn them loose within the colony; required the rabbits already in the colony to be confined in hutches or boxes constructed according to certain prescribed regulations, and authorized

SESSIONAL PAPER No. 22b

any one to destroy rabbits found on his premises, Crown lands, or along public roads. Western Australia, profiting by the experience of her sister colonies on the eastern side of the continent, has taken measures to secure protection from the evils of indiscriminate and ill-advised acclimatization by the passage of the so-called "Destructive birds and animals Act."

The difficulties of coping with the rabbit plague in Australia were graphically explained by Mr. W. D. Severn in an address at the Imperial Institute, London, two or three years ago. He pointed out that three pairs of rabbits were originally introduced and they soon threatened to turn the country into a gigantic rabbit warren, a single pair it had been found resulting in a progeny of over 13,000,000 rabbits in the short period of three years. Fencing, poison, digging burrows, and driving the animals into limited areas were adopted at enormous expense; but the use of arsenic seemed to be most effectual. Sir Samuel Baker, on the same occasion, referred to the reward of \$125,000 offered by New South Wales in 1887 for a reliable remedy, and no less than 1,800 schemes were submitted, and the plan was adopted of enclosing, in a fence 15,000 miles long, the rabbits near a supply of water which was poisoned, and they were now being reduced in numbers.

It is not necessary to make any lengthy reference to the introduction into the waters of this continent of German Carp for the reason that six years ago I expressed pretty fully my views upon the matter. (See Special Report 'The Place of Carp in Fish-Culture,' Mar. & Fish. Report, Ottawa, 1896.)

While opinions seem to be divided as to the evil or the good resulting from carp-culture, it must be confessed that they have spread far beyond the limits anticipated by those who initiated the stocking operation. The fish have spread over a wide area, and have invaded Canadian waters far from the sites in the United States where they were originally planted. I have been repeatedly assured by Canadian fishermen that the large catches, which they unwillingly take in their nets, cannot be readily or profitably disposed of. In a single haul no less than 2 tons of carp, weighing 4 or 5 lbs. to 18 lbs. each, have been taken by a pound-net in Lake Erie, whereas not more than 15 to 20 tons of the valuable whitefish would be secured by a fisherman in the whole season (April to October). The fishermen claimed that all Lake Erie had been over-run by carp planted in Sandusky Bay in 1888. Commander John Brice, soon after he received the appointment in 1896 of U.S. Fish Commissioner, publicly stated his opinion on the matter of planting carp and on the policy of fish-planting which he favoured. He said:—

'There is no reason, therefore, why the streams of the United States should not be full of fish of the species either natural to their waters, or which have become acclimated to such a degree that they flourish as though they were native to them.

'We do not propose to introduce fish in a stream without a full investigation as to its characteristics and the effect it will have on the natural denizens of such waters.'

'Now, take your Potomac River, for instance, as a case in point to illustrate what I mean. A few years ago the Potomac was full of black bass from above Cabin John Bridge to its head waters, and fishermen enjoyed magnificent sport all along it. Now there is general complaint about the scarcity of the bass in the Potomac. This change is due to no other cause than the carp. The carp is a natural scavenger, and he destroys the spawn of a fish wherever he can find it. The carp follows the schools to their spawning beds and sucks up nest after nest without fear of interruption, because he is too big and unwieldy for the fish he pursues to drive him away. There will be no more carp distributed by the United States Fish Commission while I am in charge of it, and they will be cleaned out of all the ponds wherever they may be that come under the authority of this office.'

Quite recently the Attorney General of Indiana announced that a law for exterminating carp had been enacted and the fishery officials duly notified. The Fish Commissioner asked the Attorney General if he could have the lakes in northern Indiana seined and kill the carp, gar and mud turtles, which are found in those lakes by the thousands and which kill the kind of fish that the State desires to foster.

Attorney General Taylor's recommendation is that an immense seine, probably 1,000 feet long, be procured and all the smaller lakes be seined. When the seines are hauled in the carp, gar and mud turtles will be killed, but the bass, perch and other fish

1-2 EDWARD VII., A. 1902

brought up in the seine will be immediately thrown back in the water. Mr. Taylor believes this will do more to preserve game fish than any one thing that could be done. The Moon Railroad Company will seine Cedar lake in a short time and will kill all the carp, gar and turtles brought up in the seine. The work will be done under the direction of the commissioner.

The policy adopted, for a period of many years in fish-culture operations in the Dominion has been on wise and cautious lines. A well-informed policy, confining the work mainly to the hatching and planting of salmon, lake whitefish, and great lake trout, the last frequently called salmon-trout, has been uniformly pursued, and the policy has proved beneficial and safe.

Of course many species have been constantly pressed upon the Government's attention; but most of the fish recommended being more or less predaceous, some of them extremely so, it has been felt that even at the risk of disappointing the public, the propagation and planting of these kinds was hazardous, and might result in infinite harm.

There can of course be little risk in the planting of salmon if the conditions are favourable. As a rule a salmon-river is not perfectly adapted for other fish, unless it be sea-trout and brook-trout, and in certain cases sturgeon and striped bass. Cusk or fresh-water ling and togue or touladi occur in such rivers as the St. John River, New Brunswick; but, on the whole, the salmon is the predominant fish in our Canadian salmon rivers, and efforts to keep up and to increase the supply of those noble fish by means of hatcheries, must be an unmixed benefit if properly and successfully carried out. The planting of lake-whitefish fry involves no danger to other species. Its habits are inoffensive, it is toothless and subsists chiefly on small crustaceans, mollusks, and similar minute food. It is stated to devour small fish, such as young gold-eyes and fresh-water clupeoids in Lake Winnipeg and other great-lakes, but such predacity is unusual. There is not the same certainty about the great lake trout. It is a powerful and voracious fish, well armed with strong teeth, and a most formidable foe to all smaller fish, if planted in confined waters. In the great lakes of Canada, the trout during most months of the year frequent the deeper waters, and only move into the inshore shallows about spawning time, *i.e.* late October or early November. During the spring and summer its habits and the nature of its food keep it in regions not frequented by whitefish, hence these two important marketable fishes have co-existed in Canadian waters generally. Both fishes spawn in the fall, and in many localities they have been taken together in the same nets, the two species at this time being more or less in company, though as a rule whitefish do not spawn on precisely the same grounds as the great lake-trout. It may also be added that during the spawning period neither of these fish take much food, indeed the condition of the stomach indicates that they fast at that time, hence there is little danger then to the inoffensive whitefish from the proximity of the hordes of voracious lake-trout.

The maintenance of the balance between predaceous and non-predaceous kinds of fishes depends, no doubt, upon a variety of causes. I have indicated one, *viz.*, the different habitats frequented by various species in the same waters, but others might be named. When, however, this balance is disturbed, as in the great lakes, by fishing operations on a vast scale the results are frequently quite inexplicable. Thus the decline of the lake whitefish fishery in Lake Erie has been followed, not by a great increase in such predaceous species as the blue and yellow pike-perch or pickerel (*doré*), but by an enormous increase in the takes of so-called lake-herring or lesser whitefish, a species of inferior edible qualities and of less market-value. In Georgian Bay, and the waters of Lake Huron generally, the diminished supply of whitefish seems to have been accompanied by a very appreciable increase in the quantity of great lake-trout. In Lake Ontario twenty years ago the whitefish ranked as of first importance in quantity and market value, the lesser whitefish (called lake-herring) ranked next, and the lake trout came third, followed by the pickerel or *doré* and by the long-nosed pike (*Lucius*) or grass pike.

Now, however, the inferior, or lesser whitefish (so-called herring) and the grass pike are of chief market importance, the pickerel or *doré* ranks next, and the whitefish and lake-trout are of comparatively insignificant moment. It is extremely probable that

SESSIONAL PAPER No. 22b

physical changes in the character of the great lakes, and the surrounding country, have been potent in bringing about these results; deforestation no doubt working vast changes, and the extensive use of the deadly drag-seine on the shallow spawning beds hastening the deterioration: but at the same time, it is not easy, from a biological point of view, to see why a smaller and inferior species of whitefish should survive, along with voracious species like the grass-pike, when the larger and more valued kind of whitefish has declined in quantity to so serious an extent.

It requires no argument or production of elaborate evidence to demonstrate that a weaker species is bound to succumb in the struggle for existence with a stronger and more voracious species. Nevertheless fish-culturists are continually urged to try the risky experiment of planting the weaker and more inoffensive kinds of fish in waters abounding in powerful and predaceous fish, and to thus add to the unequal nature of the struggle. The authorities charged with the task of framing fishery regulations are persistently pressed to afford increased protection to the latter. Thus in the waters of Lake Huron and Georgian Bay while the valuable whitefish has decreased in abundance for a number of years, the smaller and less valuable kinds have not done so, and the great lake-trout has apparently shown an improvement in numbers, and this last-named fact is the more remarkable because the present close season, 1st to 30th November, is admitted to cover only part of the spawning period. The International Commissioners in 1896 were struck by this noteworthy state of things. They say (pp. 108 and 109 of their report):—

‘There has been a vast decrease in the abundance of the whitefish in Lake Huron, and this decrease has continued unchecked to the present time, the same being due to a complication of circumstances. The location of the most extensive fishery for this species has varied from time to time, and it is significant that during any given period of which we have knowledge, the region of the greatest fishery, whether by gill nets or pound nets, has been the region of greatest decrease.

‘It is impossible to say whether or not the amount of apparatus alone, unaccompanied by other abuses, would have induced the decrease noted. There is no doubt that considerable harm is done by the capture of small whitefish in the pounds, and perhaps to some extent in the gill-nets fished ostensibly for menominees. Along the north shore on both sides of the boundary line the catch of small whitefish of inferior value to the fisherman, but of vast consequence to the fishery, is an evil of the pound-net fishery which requires correction.

‘A considerable proportion of all the whitefish taken in the lake are caught during the spawning time, when they are close inshore and readily accessible, and the facility with which they may be taken at such times is probably, to some extent, responsible for their decrease.

‘During the period for which we were able to acquire information there appears to have been but little decrease in the trout. The large shoal-water variety caught in the fall has apparently fallen off to some extent, but the deep-water form exists in apparently undiminished numbers. The immunity of this species from the effects of the various agencies which have decimated the whitefish is, no doubt, due to its habits and distribution. It is less gregarious than the whitefish, and, instead of being confined to the coastal-platform, it has a lake-wide distribution and an apparently wide individual range of movement. It apparently seeks its food at all depths and finds it in considerable variety and is, therefore, not much affected by the pollution of the bottom. Although the gill-net fishery for this species is quite extensive, we have failed to note any serious effect upon its abundance. Young fish are sometimes caught in the gill-nets, but as they usually become entangled by the teeth no remedy suggests itself.’

Many fishermen before a Commission, which sat in 1892, gave similar views. Thus Mr. Hutchins, of Midland, Ont., informed the commissioners that ‘whitefish are the most valuable fish in the Georgian Bay—that is for the fishermen—and should be husbanded more than any other, for they can be destroyed more quickly than any of the other kinds of fish by reason of their innocent nature; they are not greedy or voracious, while salmon-trout feed largely upon them.’

In my report already referred to (32nd Ann. Rep. of Dept. of Mar. and Fisheries, p. lxxvi), I drew attention to this matter and pointed out that ‘the great lake-trout is

a strong predaceous and, in some respects, undesirable fish, making war upon whitefish and all other kinds. The present close season for the great lake trout is perhaps too short, but it has sufficed in Lake Huron and Georgian Bay, at any rate, to ensure the maintenance of a fair supply of these fish. It is plain that predaceous species call for less protection than more harmless and defenceless species.'

The general conclusion to be drawn from all these observations is that a knowledge of the habits of fish, of their ability to accommodate themselves to their surroundings and hold their own against other species, is essential in carrying out a system of planting young fish and of stocking new waters. Hardly less important, perhaps even more important, is a knowledge of the probable increase and predominating power of a particular kind of fish introduced, or about to be introduced, into waters to which they are not native. There is grave danger in this work of transplantation unless it be done with a full knowledge of the facts and possibilities of the case. Serious harm may ensue—harm which may be irremediable—unless caution and discretion, based upon accurate knowledge, be exercised. At one time fish-culturists of prominence and authority were eager to introduce every possible kind of fish into all available waters. Western lakes and rivers were to be stocked with eastern fish, and *vice versa*, while a great variety of fishes from Britain, Germany, France, Austria and other countries, were to be introduced into the waters of this continent; also, as part of the scheme, North American species were to be shipped for planting purposes in return. Such hasty and ill-considered proposals were likely to do more harm than good. Thus, our American catfishes, excellent though they may be for certain table purposes, are altogether undesirable in waters fitted for superior game and commercial species. The German carp, welcome no doubt to Germans and Austrians, who in their native lands never knew any better fish, is out of place in the crystal waters of Canada, and the tench, barbel, bream and other fishes, native to Britain, are altogether undesirable in the waters of this western continent. But the objection to these fishes is not that they would devour or drive out our more desirable native fishes, but that they are not worth the room they would occupy in our waters, and the food which they would devour is required to sustain and nourish the fry of native American species. The same objection does not appear to have so much force when applied to the case of fishes with desirable qualities. Yet the policy adhered to by the Dominion Government even in regard to such fish has been a wise one. No encouragement has been given to proposals to hatch and stock Canadian waters with fish from Europe. The English river-trout, often called brown trout, is a case in point. But that the policy we have followed is wise is clear from the change in the views of the principal United States officers charged with the work of Federal Fish Culture. Thus Commissioner Brice, in a published interview, said:—"We do not propose to introduce any more foreign fish in American waters. There is some demand for the introduction of the German trout in this country, but the persons who desire such an importation apparently do not realize what an effect the appearance of this fish would have upon our native varieties. The German trout is stronger, larger, more vigorous and vicious, and grows faster than any of our variety, and if it were introduced into this country it would quickly drive out the brook-trout in the East and the rainbow-trout in California. 'No,' continued Commissioner Brice, 'the care and preservation and increase of the fishes indigenous to American streams, or which have been found to adapt themselves to our waters without driving out or destroying the native varieties, should be the aim and object of the Fish Commission.'

Hence a comparatively small number of trout will thrive, as just remarked, in a lake which will sustain a disproportionately larger number of whitefish. There are lakes in Alberta, Assiniboia and Saskatchewan which at present yield an abundant supply of delicious whitefish to the settlers, and Indians and Half-breeds; but that supply would not only be endangered, it would inevitably disappear were brook-trout, commonly called speckled-trout in eastern waters, introduced. Fine salmon rivers along the Atlantic coast have, in many cases, suffered from trout, both the fresh-water and the sea-run variety. Indeed in the provinces of Quebec, New Brunswick and Prince Edward Island, some rivers have been so seriously overrun that the diminution of salmon in them may be largely traced to the excessive number of trout. It was actually urged a few years ago that the use of dynamite (prohibited by statute) should

SESSIONAL PAPER No. 22b

be permitted for the express purpose of diminishing the hordes of trout which in some pools had become superabundant. Had that extreme step been sanctioned by the Dominion Government, no doubt the trout would have been reduced in numbers; but such immense quantities of salmon, young and old, would have been killed that the harm might not have been repaired for many years. Reputable persons held, however, that in the long run the river would have been benefited. The usual food of the trout is aquatic larvæ, beetles, flies and small fish; but it is a most inveterate destroyer of salmon eggs and fry. When these are not to be had it will attack even larger fish. The serious decrease in the supply of the beautiful and valued grayling in the State of Michigan has been attributed largely to brook trout. The *New York Forest and Stream* (July 1901, p. 278) said upon this matter:—

‘The Michigan graylings are now only found in the upper waters of a few of the streams of that State, and are, sad to say, rapidly being exterminated. They apparently cannot withstand the inroad of the brook and the rainbow-trout, which are quickly taking possession of the once fruitful grayling waters of Michigan. The angling tourist will still find them in upper Manistee and in Ausable River of the State named.’

When insect food, or even the young or the mature stages of other fish are not to be readily had, the trout turns cannibal, and devours the eggs and young of its own species. As Mr. S. H. Campbell said in his official report for 1901, on the State Fish Hatchery, Wyoming:—‘The trout is the most destructive fish to its kind, in the matter of destroying its eggs during the spawning season. While on the spawning beds hundreds of trout are gathered, male and female, and devour the eggs as fast as they are deposited on the gravel and bottom of the stream or lake. It is only the eggs that are covered or fall among the rocks that ever hatch out from natural reproduction. It is not the other kinds of fish, such as suckers, chub and dace, that destroy so many of the trout eggs: but it is the trout themselves.’

Species which for market or for sport are of highest value to the community have been hatched under the auspices of the Dominion Government, and dangerous or doubtful species have been excluded. Amongst the species which have rarely, or not at all, been included in Canadian fish-culture, but which correspondents have persistently recommended for inclusion are:—Canadian brook-trout, rainbow-trout, black bass of both species, sturgeon, yellow perch, cat-fish, pike, maskinonge and other kinds.

Let us take the brook-trout first, for in the opinion of most people it is a fish which can be regarded as out of place in no lake, river, or stream. It is a mistake to introduce brook-trout into lakes in which whitefish are abundant, unless such lakes be of great extent, and contain considerable depths.

In our North-west Territories, where fish have a very special value, a value hardly to be paralleled in other provinces less remote from the sea-coast or great lakes, a small lake stocked with whitefish is of far more importance than if stocked with trout. Not only will the same area of water furnish a greater amount of fish-food (if whitefish are planted not trout) but trout are predaceous, whereas whitefish are not. Trout devour other species, and even make war upon each other. It is no doubt impossible in most salmon rivers to exterminate the trout, or prevent their inroads; but every means should be taken to keep their numbers down and successfully check their superabundance. A salmon river should, as far as possible, be a river for salmon, and no step should be neglected to make it so. On the other hand a trout stream is not to be despised; but a trout stream should be a stream for trout, a stream that is to say, in which every encouragement for their increase and welfare, and every protection against injury and depletion is afforded them. It is justifiable in a good trout stream to exclude and destroy salmon for, as that most enthusiastic of trout culturists, the late Sir James Gibson Maitland once declared,—‘trout are most destructive to salmon spawn, and salmon in their turn are, after spawning, most destructive to trout.’

Closely connected with the brook-trout *versus* salmon question, and the incompatibility of cultivating both in the same waters, is the frequently suggested plan of stocking speckled-trout lakes and streams with the justly esteemed rainbow-trout of the Pacific slope. In this case again the choice between a familiar and valued native fish and a much vaunted stranger arises. No doubt the rainbow-trout is a hardy, hand-

some and fast-growing fish. As a game fish in its native waters it could not be surpassed, though it is alleged that when planted in eastern waters it becomes languid and inactive, and grows large and fat and lazy in its new surroundings. My own opinion always has been that our eastern brook-trout is the best fish for eastern waters, and that every effort should be made to increase its numbers, and prevent the continuance of that depletion in the streams of the Maritime Provinces which must soon result in extermination. There are hundreds of streams, not naturally adapted for salmon which would well repay restocking, and more active protection. Such streams no doubt might be stocked with rainbow-trout. The suggestion has, indeed, been repeatedly made, and in one of our Dominion hatcheries rainbow trout purchased at the Caledonia establishment, N.Y., have been hatched and planted in certain Nova Scotia waters. But I am strongly of opinion that the native brook-trout are to be preferred, and in this opinion I find myself confirmed by the views of a most able and accomplished fish-culturist, Mr. Alfred Ogden, the Dominion officer in charge of the Bedford Salmon Hatchery, near Halifax, N.S., who says (in his 1899 report):—

‘Although the rainbow-trout is a good game fish, an active biter and makes a strong fight, giving great sport to the angler, I think that it would be a great mistake to introduce it into waters where our native trout abounds. Where food is plentiful, and waters moderately cool, the rainbows will grow fast and attain a weight of from 5 lbs. to 10 lbs., and will no doubt soon destroy the native trout of smaller size. The rainbow-trout are not as fine a fish for food as our native species, and the flesh will not keep long after being taken out of the water.’

I am of opinion that the Pacific trout will be found to destroy both the eggs and young of the eastern trout; but that remains to be proved. Their rapid growth and attainment of a disproportionate size in a comparatively short time supports the idea that the native trout will not be able to hold their own against the introduced stranger. How important, then, it is to have more information and to use extreme caution before sanctioning attempts to stock our eastern waters generally with the voracious and quick-growing western species.

A few words upon the stocking of new waters with the justly esteemed black bass, are highly important when dealing with this subject of the planting of predaceous fish. The black bass of both species are typically predaceous fish. The reputation which they have enjoyed as game fish is well justified, and many experienced anglers go so far as to compare the landing of a large black bass, of the small-mouthed species, to the landing of a salmon. They are most muscular and powerful, and not easily played out, fighting to the last. The traditions of sport forbid this comparison of salmon and bass fishing; but I was assured, a few years ago, by a high government official from England, who was spending a holiday in Canada, that a week's black bass angling in the Gatineau waters, north of the city of Ottawa, had given him more enjoyable and exciting sport than he had experienced in English or Norwegian salmon rivers. From its very voracity the black bass is a bold and fierce biter. The angler need rarely be disappointed of a ‘rise’ if there be any black bass about. It needs some skill to strike at the right moment, and still more skill and wrist endurance to sustain the fight, with the vigorous and untiring victim, which possesses all the cunning and activity, and almost the strength of a fresh-run salmon. The comparison of the bass with the trout is more permissible perhaps than that just referred to. One of the best known anglers of Pennsylvania makes this comparison, and points out how the two fish differ. He said that to play a speckled-trout gave him a higher and keener sense of delight than to hook and play a lordly black bass. ‘Both,’ he said ‘make a glorious and intelligent struggle for life. But there the comparison ends. The trout fights like a trained boxer, the other like a savage. One arouses all my admiration and the other my blood. With one I feel as though I was engaged in a friendly contest, with the other almost as though it was the life of either myself or the bass.’

There is a lack of refinement about bass fishing, which marks it off at any rate from the traditional stately conflict with that monarch of the river, the salmon.

Waters, in which black bass abound are to be coveted; but these fish should not be desired or planted everywhere. Brook-trout without question will inevitably disappear before the new and pugnacious marauders, and in most cases the trout are the preferable fish. As a matter of fact a lake will sustain far fewer bass than brook-trout,

SESSIONAL PAPER No. 22b

for the reason that the bass are inordinate feeders, and are on the offensive at all times, though especially bellicose in June and July when in most localities they are at the height of spawning, or jealously guarding their nests. Moreover the schools of young fry are great wanderers, and will make their way into all the neighbouring waters, if access be at all possible, passing through very small and shallow channels, when foraging for new feeding grounds. Waters should be well supplied with numerous and small cyprinoids in order to satisfy the voracious appetites of the bass as they are especially liable to parasites and disease if allowed to get into poor condition, and not supplied with ample substance. Ponds, though abounding in insect and crustacean life, will not keep bass in health and vigour. They must have live fish and if possible frogs and such large 'game' for food.

At one of the United States hatcheries (Neoshosta, Miss.) five or six years ago, it was found in rearing bass and brook-trout in ponds that there was a very serious loss, for which it was difficult to account, considering the expert care afforded to the brood. It was pointed out in a published report that the 'net output of the basses and trout was very discouraging in view of the fact that these fish were carefully assorted each month and the different sizes kept separate. The loss of the bass was undoubtedly due to cannibalism, though enormous quantities of *Coriza* were collected as food for them. This food is very acceptable to the rock bass, but the black bass have been observed to eat each other when the bottom of the pond was covered with young *Coriza*. In view of these losses it is strongly recommended that the distribution hereafter be made during the months of September and October, as it is believed that a much larger percentage of the fish can be saved by so doing. In addition to this better results can be obtained by planting fish in the early fall, when the water is full of natural food.' Bass indeed are found as a rule to absolutely refuse food other than small living fishes.

Some interesting details are given in the U. S. Fish Commissioner's Report for 1898 (Washington, 1899,) on experiences in the artificial feeding of various species of fishes exhibited in the glass tanks at the Tennessee Centennial Exhibition at Nashville. Beef, liver, shell-fish and other animal matters were tried, the beef being carefully divested of the fat and sinews, and cut into small fragments suited to the various fishes. 'For the small specimens' said Dr. Ravenel, 'it was ground down fine in a meat-chopper while for the larger it was cut in pieces of varying size the black bass and crappie, which were the most difficult to keep, were fed entirely on minnows.'

There are lakes containing only small inferior species of fish, or containing no fish: but capable of being supplied with so-called 'minnows' and into such waters black bass might be introduced. There are lakes and channels, peopled only with pike and coarse predaceous species, which are equally suitable: but the utmost care is desirable lest, after the bass have established themselves, they find too ready access to neighbouring waters and overrun regions occupied by brook trout, grayling, or other desirable kinds of fish. With this proviso that the conditions as a whole are understood, and all possibilities of danger recognized and guarded against, there is really nothing to be said against the view which the Marquis of Exeter expressed on June 21st, 1883, at the London Fisheries Conference. On that occasion the Marquis said that he felt bound to utter 'a word in defence of the poor black bass, which had been so hardly used. He fully agreed with the remark that they should not be put into trout streams, where they would be as destructive as pike, but in many parts of England, particularly in his own county, there were neither salmon nor trout in the streams, only pike, perch, and the most abominable of all fish, coarse bream. In those waters the black bass would be a useful addition, he would rise to a fly; he would take any bait; he would live with the pike, and he was exceedingly good eating. They contained very few bones, and he thought the flesh was decidedly more like fresh whiting than any other fish.'

Still more care and caution require to be exercised respecting the planting of maskinonge. It is true that this huge half-brother of the long-nosed pike (*Lucius*) is in some respects less wolfish, more gamey, and a far superior fish for table purposes: but he is essentially a pike, and can only be introduced into waters which are peopled by fish equally active, well-armed and predaceous. Similarly, the pike-perch or pickerel of Canada, for which requests are continually being received in Ottawa, is a most undesirable fish where trout, whitefish or similar species are being protected and cultivated. I

1-2 EDWARD VII., A. 1902

fully agree with the opinions of a correspondent in *Forest and Stream*, N. Y. (April 21st, 1900) who affirms that 'every angler knows the nature of the food of the adult muscalonge and also knows that it is a fish of the cold Northern waters. It is certainly one of the most voracious fishes known, and in habits is to be closely compared with its congener, the wall-eyed pike or pike-perch (*Stizostedion*). Such fishes are the wolves of the waters, and their introduction should be attempted with great care and knowledge of the waters into which they are to be placed. Where they become abundant they effectually kill off nearly all other kinds of fishes in the waters they inhabit, especially if it be an isolated pond or lake where other fishes do not freely migrate into it. If such pond or lake contains only the coarser or less valuable forms of fishes, it may be well to stock it with muscalonge and wall-eyed pike, but if fine fish or other desirable game fish are abundant, it is certainly advisable to prevent these wolves beneath the waters from exterminating more valuable forms of life. Here again is decided need of biological investigations to determine what waters should be and what should not be stocked with such fish.'

Of pike, suckers, perch, catfish and similar coarse predaceous fish little need be said. There may be occasionally muddy ponds or isolated lakes where these fish could be safely planted without risk of their overrunning the whole of the waters of the adjacent district: but it may be laid down as a general rule that these fish do not need the aid of artificial fish-culture and they should be kept as far as possible within their present range. To introduce them into virgin waters where they will soon inevitably hold supreme sway, outnumbering and overcoming in an incredibly short space of time the indigenous kinds of fish, is criminal. Well might an eminent U. S. fish-culturist declare, a year or two ago:—

'There will be no wall-eyed pike distributed. We have received many requests for fish of this character under different names from various parts of the country, but they are all wall-eyed pike, pure and simple, a most pernicious and destructive fish, and, as I said, none will be distributed. The perch is another destructive fish. There are very few members of the perch family that do not come under this condemnatory head. Like the carp, they follow the schools of fish and destroy their spawn.' The damage done by unwise planting of fish it may never be possible to undo. A recent private letter received by me, from a well-known gentleman in the province of Quebec, indicates how seriously such a fish as the yellow perch may affect fine angling lakes,— 'I own "he says" a lake in the County of Portneuf in which, some years ago, nothing but trout could be found; to-day, however, the only fish found there are perch.' In some Canadian lakes the yellow perch, formerly unknown or not occurring numerously, has increased so vastly as to endanger all other fishing. The Pennsylvania fishery authorities were the first to point out, some years ago, that the yellow perch, in even so large a body of water as Lake Erie, were becoming a menace. Curiously enough as they increased in the greater waters, they were observed to become scarce in the smaller lakes and streams—to quote from their report.—'While yellow perch are becoming scarce or have disappeared in some of the streams and ponds through the thoughtlessness of anglers and boys, and the ravages of pot hunters and criminals, the fish seem to be actually on the increase in Lake Erie and in the other great chain of inland seas of which it is one. To such a surprising extent is this true, that a large number of the lake fishermen became firmly convinced that the Fish Commissioners of this and other states, as well as of the United States government, had confounded the identity of the yellow perch and the whitefish, and had taken to hatching and depositing the fry of the former in the waters instead of the latter.'

The spawn of the perch is one of the best adapted for accidental transportation from one lake or river to an other, and, while in many cases the regrettable step has been taken of actually depositing spawn or fry in new locations, there are no doubt multitudes of cases in which waters have been stocked by birds, especially ducks and other aquatic species. The spawn of the perch is arranged in long tenacious ropes or frills, and being laid in shallow water, becomes readily entangled in the feet or feathers of water-frequenting animals. When yellow perch establish themselves, they soon dominate the whole of the locality, and are most difficult if not impossible to exterminate. A newspaper published at Sturgeon Bay, Wisconsin, recently stated that 'twenty tons was about the

amount of perch that was taken in this bay during the past season. At an average of one cent a pound the dealers have paid out \$1,000 on this account. Despite this enormous catch from year to year, there appears to be no perceptible diminution of the perch in these waters, but they appear to be as numerous as ever.' Lake Memphramagog was over-run with perch a few years after they were planted by persons in Vermont though the salmon trout devoured them, seven or eight perch being taken out of the stomach of a large trout.

The power of successfully maintaining their numbers in the contest with other species, is very marked in many kinds of fish, and it is necessary to take this into account, when framing protective regulations, as I have pointed out elsewhere (See Report of Marine and Fisheries Department—1899—p. lxxvi). Commercial fishermen have felt the force of this view, and on many occasions during the sittings arranged by the Dominion Government for the special Ontario Fish Commission, which took evidence all along the great lakes, in November and December, 1892, prominent fishermen gave expression to this sentiment, that much legal protection is not necessary in the case of some of the predaceous fish above named, and that their undue increase has resulted in the depletion of more valued and more desirable species. The opinion expressed by Mr. W. W. Church, of Midland, a fisherman of over 40 years experience, may be taken as typical. He told the commissioners that—'Whitefish were more numerous in Lake Ontario than any other kind of fish. Pike, pickerel, bass and trout, eat young fish, and some kinds of fish destroy the spawn. Whitefish nevertheless, held their own in the old days of fishing and salmon-trout were plentiful at the same time. When whitefish dropped off, salmon-trout were gone into more fully, and then they likewise dropped off. It would be a benefit if pike and pickerel, bass, eelpouts and dogfish were taken out—it would benefit the whitefish.'

The International Commissioners (Dr. Wakeham and Mr. Rathbun) four years later, found the same opinion prevalent in certain fishing localities, and on p. 79 of their report, referring especially to the pickerel or doré, (otherwise sauger or wall-eyed pike), they remarked that 'the policy of affording any measure of protection to the wall-eyed pike and its related species the sauger, has been strongly deprecated by many fishermen because of their well-known predaceous habits, and it is even claimed that the catching off of these forms in Lake Erie has produced an increase in the supply of herring.' While the Commissioners did not feel able to accept the conclusion reached by the fishermen, they placed on record the fact that the pickerel (blue and yellow) are very destructive to other fish. From their own examination of specimens they state that 'the species seems almost entirely piscivorous. Of many examples examined, nearly all contained some fishes of some kind or other and scarcely anything else. The species found ofteneſt in their stomachs was the alewife. Among others seen were various minnows, young yellow perch and young suckers. No young whitefish, trout or lake herring were seen in their stomachs.'

The exclusion from the scheme of Canadian fish-culture, as carried on under Dominion auspices, of the more typically predaceous species is well justified. Parties in various provinces have become impatient of this strict limitation, and in the press and otherwise, have pointed to the extreme variety of fish hatched in the establishments of the United States and other countries. But it is better to be wise in time. Even in well-protected and carefully supervised waters, like the sporting lakes and rivers in England and Scotland, the coarse predaceous fish may gain the upper hand and be reduced with difficulty. During the early months of the year 1900 the waters of the Earn, in Perthshire, Scotland, were overrun by pike, the local journals in April announcing that "the ravages of pike on trout and young salmon in the Earn have become so great, that the river watchers have had instructions to net as many of the voracious marauders as possible."

In the true interests of fish-culture, destructive measures are as necessary as those of propagation and rearing. The 'wolves' must be destroyed, that the valuable lambs may have a fair chance. Ill-weeds, the old proverb declares, grow apace, and as a rule the coarse inferior fish are able to look well after themselves, too well, the fish-culturists often thinks, when he realizes the difficulty of diminishing or of wholly clearing them

out. Exceptionally, some of these fish may be tolerated. As the Iowa Fish Commission in their Eighth Biennial Report said: 'Some of our native fishes are of so exceedingly voracious habits that they are, or have been, condemned as unfit to plant in any waters, but we have many shallow mud lakes that are totally unfitted for the better grades, and the voracious pickerel and yellow perch are perfectly at home in them. They furnish much pleasure, and a very palatable addition to the bill of fare for the people, and such waters should be kept well stocked with them.'

Artificial fish propagation if intelligently carried on takes account not only of the very different conditions which various waters provide; but also of the very different needs of the localities to be stocked. Fish, like the yellow perch, which are detested in some waters, are regarded in others as desirable fish for angling purposes. The following remarks of the late Mr. A. N. Cheney, illustrate the difficulties experienced by the Forest, Fish and Game Commission of New York, in dealing with applications for supplies of brook trout-fry. He said:—

'It is generally understood that when a person desires to obtain fish for planting from the Forest, Fish and Game Commission of New York, particularly if the fish wanted are trout, an application must be made out, filling in answers to certain questions, one of which is to declare whether or not the water is natural trout water, and another is to state the kinds of fish, other than trout, that are in the water in which it is desired that the trout be planted.

'More and more, apparently, the answer to the last mentioned question is 'pickerel' the pike commonly called pickerel. Brook-trout and pickerel do not, as a rule, thrive in the same water, aside from the fact that pickerel will prey upon trout, but occasionally pickerel will make their way into and establish themselves in the cool waters natural to trout, and generally the commission declines to furnish trout to be planted in waters that pickerel have invaded and become a fixture. One man wrote that to reject trout applications for waters that contained pickerel 'would be to remove the greater part of the streams in that region from the list of trout streams'. Another applicant who had declared that pickerel were found in the stream for which he wished the trout mentioned in his application, made a personal call upon the commission after his application had been rejected, and argued that he should have the trout he asked for because he had been frank enough to admit that the stream contained once in a while a small pickerel, for he thought no one else would have made the admission. He was somewhat surprised when there was shown to him a report made by one of the state game protectors that the stream was unsuitable for trout, not only because it contained pickerel, but because it was used by a large village as the outlet for its sewage. In one week two men asked for trout to be planted in waters infested with pike, or pickerel, rock bass, sunfish and yellow perch, and both admitted when questioned that the water was not suitable for trout, but they thought if trout were planted this act would stop winter fishing through the ice under Section 58 of the game law, and they were inclined to be indignant because their applications were rejected. One man thought if large trout were planted they could protect themselves from the pickerel. The Commission tries to inform itself about any water in which there is the least doubt as to its fitness for members of the salmon family, and so when the applicant's answers to the queries in the application are not conclusive, the state game protector of the district in which the water is situated is asked to report on it. There are plenty of streams and ponds that have been improperly planted with fish, and in some instances there is a remedy for the mistake and in others not. If there is a remedy the applicant generally wishes the state to apply it, for it means an expenditure of time and money. It is much easier to put fish into a pond or stream than it is to get them out after it is discovered that the putting of them in is a blunder.

'Again and again I have advised correspondents to remove pickerel from trout waters and try and restore it to its original condition instead of putting in other fish, generally black bass, that cannot be removed.

A word regarding the sturgeon must conclude this hasty sketch of a large and complicated subject. There is a universal opinion amongst fishermen that the sturgeon is an undesirable predaceous fish. The grounds for this opinion are far from satisfactory. Indeed, the evidence at present available points the other way, as the stomachs of

sturgeon examined by myself, and some foreign authorities were distended with food of the most innocent kind, mostly shell-fish, insects, and small food; but no spawn of young fry. The International Commissioners in the report from which I have already made several quotations, do not regard the opinion, that it is a destroyer of other fish, as very conclusive, and they speak upon the subject in the following terms respecting Lake Erie sturgeon:—

‘Originally one of the most common fishes of the lake, the sturgeon has suffered relatively more depletion than any other. It was formerly a very prominent feature of the pound-net catch, especially before its value had been recognized, and while its capture was regarded as a nuisance. The fishermen at that time destroyed it in immense quantities, and when a market had been found the supply was already much reduced. It has continued to be taken by the pound-nets and has also been made the object of a special fishery by means of gill-nets, hooks and lines and seines.

The species is at present most abundant at the extreme eastern end of the lake, and elsewhere more plentiful along the northern than the southern shore. The principal cause of decrease, and the one which has been longest in operation has been the pound-net fishery, but the statistics show a continued and heavy diminution in the supply where gill-nets and hooks alone are now employed. The sturgeon is classed among predaceous fishes by many fishermen, but in what degree it merits this distinction we have been unable to decide. In the absence of more conclusive evidence as to the extent of its destructiveness, and for the reasons stated in connection with the wall-eyed pike, we regard the species as deserving of such protection as can be granted it without detriment to the more important branches of the lake fishery. Its size and hardness permit of the return to the water alive of all immature individuals which may be taken by any method, and much good can undoubtedly be accomplished by this means, as a large proportion of the pound-net catch especially consists of the small fish. It is important, furthermore, that the extent of the special fisheries for the species should be materially reduced.’

The sturgeon might fairly claim a place in any scheme of intelligent scientific fish-culture, were it not that certain practical difficulties beset the procuring, fertilising, and handling of the eggs in hatcheries. The small jelly-like embryo sturgeon, which hatch out in 5 or 6 days, are most difficult to plant, and, until some special incubating and distributing apparatus is devised, the sturgeon cannot be brought to a condition, that is an age, which will admit of their safe and successful transportation from the hatchery tanks to the waters to be stocked. In view therefore of the prevalent opinion that sturgeon are unusually destructive, so far as the spawn of whitefish, is concerned, and considering that the obstacles to their successful propagation artificially on a large scale appears at present not very practicable, it seems desirable to rely on the natural propagation of these fish and afford them reasonable protection by means of close times, size or weight limits, and legal means of capture, rather than allow the sturgeon to be depleted in the hope that artificial hatching will maintain the abundance of this increasingly valuable fish.

To summarize the contents of the preceding pages it may be briefly said:—

- (1) Trout should not be encouraged in salmon rivers.
- (2) Black Bass are most undesirable where trout and grayling exist, and should be introduced only into isolated waters, where they cannot spread and migrate.
- (3) Pacific species are not desirable in eastern waters.
- (4) Maskinonge, pike, pickerel and perch can coexist in the same waters.
- (5) Whitefish as an element of food, as a rule, are more valuable than sporting fish in Western Canada.
- (6) Predaceous fish should be planted only where minnows and other food are abundant.
- (7) The greatest care and caution should in cases be exercised in the planting of predaceous species.

No. III.—THE AIM AND METHOD OF FISHERY LEGISLATION.

BY PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER OF FISHERIES, OTTAWA.

A special report which I published in the Departmental (Fisheries) Blue Book in 1899, fully explaining the object of legislative enactments relating to close seasons for fish, afforded, I have reason to know, information which a great many interested persons had sought for in vain. The subject is one very commonly misunderstood, if, indeed, it is generally known at all. Sir Frederick Pollock, the famous English jurist, has said of fishery laws, as a whole, that their very existence is hardly known except to the parties interested in their subject matter, yet, he added 'they are of considerable extent and intricacy, and may raise important questions of general legislative policy. Thus it is evident that in the case of the fishery laws, the question of interference with private discretion by the authority of the state has constantly to be decided one way or the other. In dealing with fresh-water fisheries the tendency of modern law making has been to impose new restrictions; in dealing with sea fisheries to remove old ones.'*

In the report, above referred to, I pointed out the very diverse reasons, which led to the framing of the different existing close seasons for fish of economic importance in the Dominion, and numerous letters, addressed to the department, or to me personally, show that my attempt had furnished precisely the kind of information that was desired.

The aims and objects of all effective fishery legislation, apart from what is called International law, may be summarized under three or four heads: but the methods by which such aims and objects are achieved are complicated and various. The method of fishery legislation has been moulded into such diverse forms that the body of enactments in Canada, as in other countries, is cumbersome and complicated in the extreme. The Canadian code of fishery laws and regulations is the result of gradual growth and accretion through a period of many years, and its various provisions exhibit much overlapping and inconsistency, if not absolute self-contradiction in some cases.

In various parts of the Dominion there is a common impression, though a grossly mistaken one, that fishery regulations are merely a means of securing revenue to the government, and are essentially a method of ensuring a form of indirect taxation. Much of the irritation and resentment at fishery regulation aroused amongst the fishing population may be traced to this erroneous idea. They say 'why should our vocation, our means of livelihood be taxed, and others go free?' Certainly fishery regulations affect the fisherman's vocation, and the imposition of license fees, the infliction of fines and penalties, and other subsidiary accompaniments to legal processes, bring to the public treasury, pecuniary contributions which are added of course, to the public revenue. Fishermen are led from this circumstance to regard fishery laws as a somewhat covert method of compelling them to pay additional tribute to the state; and government commissions, conducting inquiries into fishery matters, encounter no obstacle greater than the unwillingness of fishermen to help, as they think, in formulating new and oppressive enactments, and the exaction of further license fees and taxes. Fishermen shrink from freely and fully telling the facts, through fear that further and perhaps more stringent legal burdens may be laid upon them. The complaint, on examination, is found to be a very mistaken one, and one very far from just, so far as the Dominion government is concerned. It is noteworthy that the government of Canada, during the long period of over thirty years, following confederation, during which period it exercised the predominant power of issuing leases and licenses, of collecting fees, and of enforcing preservative and protective regulations, never regarded the fishing industries as fit subject for taxation. All revenue resulting was ancillary and incidental. The federal government has consistently disowned the desire to 'make money' out of the fisheries, during the years when very high authorities held that the Dominion alone had the right of property and jurisdiction in regard to fisheries. It has adhered to the same view since the announcement of the

* This applies less to Canada than to other countries.

SESSIONAL PAPER No. 22b

Fisheries Judgment by the Judicial Committee of the Privy Council, London, in June 1898, when the 'property' was declared to be, on the whole, vested in the provinces, and the 'jurisdiction' in the Dominion. Oddly enough, the very power which the federal government has always shrunk from exercising is the very power which the above Judgment pronounced to be the peculiar right of the Dominion, viz: the power of imposing a tax by way of license as a condition of the right to fish. The provinces (excepting Manitoba, the North-west Territories, and the District of Yukon) have the power to issue licenses and exclusive fishing privileges. Yet, it is precisely this right of imposing a tax for revenue which the Dominion government never exercised, and most studiously refrained from exercising. Province after province might be named in which the total amount of Dominion license fees fell short, very far short, of the amount expended upon administration and on conservation of the fisheries in the public interest. License fees were in most cases nominal, and were imposed merely to give effectiveness and force to a system of judicious control. An exceptional province, like that of British Columbia, no doubt paid into the Dominion Treasury an annual amount greatly in excess of the expenditure upon the official staff, upon the fisheries, fisheries' cruisers, salmon hatcheries, fish-passes and the like; but such revenue was altogether unsought and unforeseen, and was due to the surprising richness and rapid development of practically a single fishing industry, viz., the salmon industry, which in some respects has no parallel in the world. When the British Columbia fishery regulations were framed the license fees specified were regarded by the canners and fishermen as too moderate. The canners, on more than one occasion, in public petitions and otherwise, as recorded in the Fisheries Department, Ottawa, favoured an increase, and volunteered to levy upon themselves additional taxes or fees in order to further certain desirable objects, such as new fish-hatcheries, &c. At several conferences, chiefly of salmon canners, which I held in Victoria, New Westminster and other British Columbia centres, representative men laid stress on the desirability of levying further assessments upon the canners to promote the fisheries.

It is clear then that, to the principle underlying the policy of the Dominion government, the British Columbia fisheries were no exception; and that regulations, the enforcement of fees and restrictions, were to be carried out in the interest only of the fisheries and of the fishing population, in other words, in the interests of the public. The system of bounty, paid to Atlantic deep-sea fishermen, has been by some parties regarded as proving the disinterestedness of the Dominion government in regard to the imposition of fishery license fees; but it need hardly be pointed out that such a conclusion is inadmissible. The fund which provides the annual amount for the payment of bounty claims is really a sum paid as compensation by the United States, following international arbitration, and usually known as the Halifax Award. The bounty payments are made under authority of an Act passed in 1882, intituled 'An Act to encourage the development of the Sea Fisheries and the building of Fishing vessels.' It must be admitted, however, that the encouragement of any fishing industry by a system of Bounty would not be inconsistent in principle with the policy uniformly followed in Canada. On the contrary, it would be fully in accordance with the spirit and practice of that policy. No doubt individual provinces in the exercise of their rights, defined and decided in the Fisheries Judgment, 1898, have vigorously followed the reverse policy and have already converted the fisheries into a means of considerable revenue. The Dominion government never favoured that view of the matter, and never regarded the fisheries as a source of revenue to be made to yield a maximum annual return, and has scrupulously abstained from imposing upon the provincial licensees the 'tax by way of license fee' for revenue purposes, which the Fisheries Judgment so clearly specified as within the right of the Dominion authorities.

It is interesting to inquire, when entering upon a review of the scope and method of fishery legislation, to inquire why it is that in all civilized countries, fishery regulations have been devised? Why has it been deemed justifiable and necessary to have fishery laws at all? Fishing industries, it must be replied, are really the exploitation by a section of the community of a natural resource, which is the heritage of all. 'It cannot be questioned that the inhabitants of this Dominion' said the late Mr. Justice Gwynne, 'in whatever province they may reside, have an interest in the regulation

* The reverse, however, could not in any case apply, viz.: the imposition of a provincial fee in addition to a fee for a legally valid Dominion license *Vide*, Privy Council Reports. London No. 8. 1897, p. 23.

1-2 EDWARD VII., A. 1902

and protection of the fisheries, whether they be sea-coast or inland and this interest of the public is not the less because in our inland waters, consisting of rivers and lakes teeming with the finest fish, private persons may have property therein.' * Such being the case, the whole country, speaking through the legislature, has the duty and the right to regulate the fisheries, to protect, preserve, and enhance their value and productiveness, as a national resource. The resident on the sea-coast has therefore a voice in deciding whether or not inland waters shall be preserved and rendered more productive, or depleted and destroyed; while the dweller far inland has the right to say whether or not some maritime fishery, be it for lobsters, mackerel, seals or whales, shall be allowed to be destroyed or be properly and effectually protected. It is fortunate that this is so, for, observant and intelligent as fishermen are, their views are often narrow and one-sided, if not wholly mistaken. They rarely combine to foster the common interests of all or to further the industries upon which they as a class depend. The public have an interest in the proper carrying on of the fisheries. As Mr. C. M. Keyes, one of the best known men connected with the Ohio fisheries, said some years ago 'the fish product of the great lakes has become such an important article of food to the vast population tributary thereto, that laws prohibiting unreasonable waste or destruction of this valuable commodity of commerce should be enacted and enforced. The people generally look to commercial fishermen only for their supply of fish food, and are in a way as much interested in making commercial fishing a successful industry as are the men operating the fisheries.'

No doubt the indifference of fishermen generally to the interests of the public, and of their own class as a class, is due to thoughtlessness. A Scottish fisherman, in his evidence before the Royal Commission on Trawling in Great Britain (1884), tersely expressed it, 'in the fisheries,' he said, 'it was always a case of each haul all, and deuce take the hindmost!'

The New York *Fishing Gazette*, February 29, 1896, contained a reference to this important matter of the attitude of the fishermen towards the interests of the state, and the position of the fishing industry in relation to state regulation and restriction, and the following extract, it must be granted, sums up the situation most accurately:—

'This industry should not be hampered by laws based on the fanciful theories of the fish culturist or influenced by the arguments of the fish vandals who operate on the plan that all are fish that come to their nets, but the best interests of the whole public should be considered, and in the end such a system of laws would be to the best interest of the producer and the consumer alike.'

The position of the fisherman is, of course, very unlike that of the ordinary labourer or craftsman and wholly different from that of the trader or manufacturer, hence his views as to the larger national aspects of his industry are often peculiar. Like the hunter's profession, the fisherman's pursuit is full of danger and uncertainty; and the hunter, as is well known, is too often selfish and limited in his views, and will kill deer or other game that should be spared, lest another hunter may secure it. Now, while sea-fisheries may be pursued by any British subject without let or hindrance apart from legislation of a limited local character, or under conventions with foreign powers applicable only to particular waters, the estuaries and fresh-water fisheries are placed in quite a different category. In the tidal parts of navigable rivers fishing is of common right, unless limited or superseded by private right—a very unusual circumstance; but in non-tidal waters the exclusive right to take fish belongs to the owner of the soil. Unless alienated and shown to have been transferred to some grantee, such ownership belongs to the Crown; but in Canada the Crown is represented both by the provinces and the Dominion. As was stated in the Fisheries Judgment, 1898, waters whether vested in the Crown, as represented by the Dominion or as represented by the province in which they are situated, are equally Crown property and the rights of the public in respect of them are precisely the same. For this reason there has arisen some confusion and not a little overlapping in the management of the fisheries; but the decision by the highest tribunal in the empire that the enactment of fishery regulations and restrictions is within the exclusive competence of the Dominion legislature and is not within the

* Judgment in the Exchequer Court of Canada, *vide* Reports of Queen v. Robertson, Ottawa, 1082.

SESSIONAL PAPER No. 22b

legislative powers of the provincial legislatures, sets finally at rest all question as to the authority of the federal government in enacting fishery laws. The legislative supremacy of the federal government in fishery matters continues unimpaired and it is important therefore to point out some of the main characteristics of that legislation.

It is worthy of note that a great deal has been accomplished in the way of fishery regulation and restriction by means of unwritten law. And so long as the Dominion government practically enforced all fishery regulations, very much was achieved by prevention, by moral suasion, by timely warning of more rigorous future action, and especially by attaching conditions to Dominion licenses entailing the cancellation of fishing privileges in case of violation of the regulations. There was a laudable desire, on the part of successive Ministers of the Crown in Ottawa, charged with the administration of the fisheries, not to unduly multiply offences or to make the fishery laws too complicated and exacting. This use of moral leverage, this exertion of indirect pressure through the license system, worked most successfully, and undue harshness, formal legal processes, and an undesirable increase in criminal offences, were avoided. To make every trivial abuse an illegality, and every offending fisherman a criminal, was too serious a measure, and was successfully avoided by the system referred to.

Of course, all fishery laws to be effectual and satisfactory ought to be based upon facts and upon accurate information. Here was an initial obstacle. It was difficult to obtain the desired information from the fishing population, while the rival interests of different classes of fishermen, and of the merchants, buyers, packers or canners, &c., added to the difficulty. Fishery interests had often to be subordinated to commercial and industrial interests. Manufactures were frequently given precedence. A noble river, valuable for its fisheries, might be polluted, blocked by dams and utterly destroyed in the interests of the lumber business or of chemical and other industries. Of course, fishery authorities have often stated that by exercising a little care and caution the fisheries and manufacturing industries could continue side by side. The utilisation of refuse and waste products and the exercise of a little consideration on the part of commercial men would have saved from ruin many a fine river and lake; but, in an age of iron, harsh iron methods often prevail.

From the outline here attempted of existing fishery regulations in Canada any historical review or philosophical discussion of the ultimate ground of fishery laws must be omitted. A sketch of the evolution of fishery laws would be superfluous. As Sir Henry Maine, in his 'Ancient Law' showed, a legal enactment in its present form proves to be, on analysis, not an isolated rule, but the last link in an historical series, the first link in which was probably an arbitrary act of compulsion or an *ex cathedra* dictum. The series of precedents, which have yielded the body of statutes and regulations now in force started in the assumption, or rather the fact, that fishery rights were vested in the Crown. They might be so vested as *patrimonium* and capable of alienation, or as held in trust for the public. Nor was the claim of the Crown limited to rivers and inland waters, or to coastal limits. Just as Spain and Portugal divided the Atlantic Ocean between them under authority of a Papal Bull 1493, so England claimed the North Sea or German Ocean, the Bay of Biscay, the English Channel, and the seas north and west of Ireland, and so late as 1604, the Scottish crown claimed the fisheries for a distance of 14 miles from low-water mark, as is specified in the draft Treaty of Union with England. When private parties or public bodies acquired fishery rights as grantees of the Crown, such rights were exercised under regulations. Thus in Scotland all Salmon fishings are enjoyed by Royal grant: but from the earliest times the holders were required to observe strict conditions imposed in the public interest. As early as 1175, a Statute of William the Lion required engines and traps to be so set as to leave a passage clear in mid-stream for the ascent of the migrating fish to their spawning grounds. The Act is very quaintly expressed, and enjoins that passage in the middle of the stream or river is 'aye to be free sae muckle as a swine of 3 years old well-fed is of length soe that neither the gronzie (snout) nor the tail may win tae ony side.' The statute also shows the antiquity of the observance of Sabbath rest even for salmon in Scotland, for it provides that no fish shall be taken from Saturdy evening until sunrise on Monday. Many statutes of a similar nature all directed to restrain certain modes of fishing continued to be passed by Scottish Parliaments down to the date of the Union. The objects of these statutes, according to Lord Westbury, were three in

1-2 EDWARD VII., A. 1902

number—‘One to insure to the salmon a free and unimpeded access to the upper fresh waters which are the natural spawning grounds of the fish. The second to secure the unimpeded return to the sea of the smolt or young fry of the salmon. The third to prohibit the killing of unclean fish.’

In Canada the Crown is represented by both the Dominion and by the Provinces, and much complication has resulted, in consequence, in the interpretation and administration of fishery laws. French seignorial rights, too, enter into the matter in the Province of Quebec, and in New Brunswick. But apart from these higher and more difficult aspects of fishery law and fishery prerogative, there remains that practical side of fishery legislation, which has directly for its object the protection and preservation of the fisheries as a national resource.

The basis and aim of fishery legislation may be said to be fourfold; or rather four main interests have been prominent in the framing of fishery regulations generally. These are: First,—the interests of the fish. If there were no fish there would be no fishermen and no fishing industries. Hence the preservation and fostering of the fish-supply in their native waters is imperative. Second,—the interests of the fishermen as an industrial community. The body of fishermen have legitimate rights, which must be recognized by the state. The rights of labour cannot and ought not to be ignored, and the fishermen form an important part of the population in most countries. Both on account of their numbers, of the households dependent upon them and on account of other industries involved in and bound up with the fisheries, the fishermen have a recognized claim to consideration. It is hardly necessary to point out that net and twine making, boat-building, barrel and box-making, tin and can factories, ice and salt industries, and the like, depend very largely on the fisheries. Their importance is vast and far-reaching. Third,—the interest of the state as a whole. The interests of the state, or as it is commonly expressed, the public interest, may not always coincide with the first or second interest described above, indeed they may come into serious collision, and many authorities might be quoted to show that the public interest should be paramount and that all the interests should be regarded as of secondary importance. The most patent case to the ordinary citizen is that of mill-owners blocking by dams, or diverting the channels of important rivers for their own private business purposes. The Supreme Court of Iowa, in a case before them two years ago, publicly expressed its view as follows:—‘The streams and lakes are the natural abiding places for the fish. In them they cast their spawn and multiply their species. They constitute an important and valuable article of diet for the rich and the poor, and, with the ways open that nature has provided, they are accessible to both. If the lowest riparian owner of a stream may legally block the way of their migration, the consequences to result to the thousands are readily imaginable. The law that would permit it would be the entering wedge by which the few would profit at the expense of the many.’ Fourth,—International interests, which may affect the comity of nations and which have often reached a stage so crucial and perilous as to override the interests of the fish, the fishermen and the nation, requiring these interests, indeed, to a large extent, to be sacrificed to avoid momentous and lasting evils, such as foreign unfriendliness or even war. The imminent danger of armed conflict has more than once shown that international interests are of supreme significance; but, at the same time, the lesser interests have been frequently insisted on, and opposing international claims and pretensions have been set aside or compromised. The history of international fishery legislation is, indeed, a history of compromises.

In the foregoing summary the interests of the fishermen, or rather of the fishing industries, have been referred to as one, as though it were possible to reduce them to a simple type easily understood, and succinctly stated. But such is not the case. The rival interests of different classes of fishermen furnish those officers, charged with the administration of fishery regulations, with some of their most difficult problems. Fishermen often fall into opposing classes on account of their different methods of fishing. The steam-trawl fishermen on the east coast of Britain and the long line fishermen were long at war with each other; the lobster fishermen of New Brunswick were regarded by the salmon fishermen as a most injurious class, just as the suggested use of salmon traps in British Columbia has been most bitterly opposed by the drift-

SESSIONAL PAPER No. 22b

net fishermen of the Straits of Georgia and the Fraser River. It is matter of common knowledge that the sportsmen and anglers are, as a rule, most jealous of the fishermen who use nets and who fish for market; while even such closely related vocations as oyster fishing, and clam fishing, both allied shell-fish industries, have frequently come into conflict. It is less surprising, however, that fish canning and packing industries should be often opposed to the actual fishing industry, as the interests of those who merely handle and put up the products may frequently differ from those who secure the raw product, viz.: the fishermen. Packers and commercial agents may wish to limit the supply owing to the state of distant markets, when the fishermen wish to dispose of large catches; or the prices desired by the fishermen may not appear reasonable or practicable to the merchants.

On the whole, however, these various interests converge, and as the fishermen and the buyers, packers or merchants, are mutually indispensable, the fisheries to be carried on successfully, require the united efforts of all concerned.

I have stated that fishery laws may be grouped in four categories, corresponding to the four great interests mentioned in the preceding pages. These, in a more detailed manner, may be divided into ten separate divisions as set forth below.

(1.) Laws designed directly to preserve and protect fish. They may be subdivided as follows:—

(a.) Close times enforced for a few hours only daily, or on a certain series of days, like the regulation regarding dipping for gaspereaux or alewives in Nova Scotia streams.

(b.) Weekly close times of 24, 36 or more hours weekly and known as Sunday close times devised to secure the safe passage up-stream of part of each ascending school of fish, especially salmon, to the spawning grounds. Most salmon authorities hold that if a few breeding fish of each salmon school be allowed to pass up, including the earlier and later schools, a river may be kept in good productive condition. The Tweed Salmon Commission, Scotland (1896) laid stress on that fact. Such a weekly close time covering 42 hours in the salmon rivers of British Columbia is frequently rendered ineffective by the netters, who on Monday morning go as far up the river as the law allows and overtake the fish which passed up during the prohibited hours of the day before (Sunday).

(c.) A short close season such as was tried for some years in British Columbia covering three or four weeks during the later run of salmon, with the object of ensuring the safe ascent of a sufficient number of fish. These fish belonged to the early schools of coho or silver salmon (until recently of no great economic importance) and the late run of sockeye or blue-back salmon, which in many cases are not suitable for canning being soft, ripe for spawning, and in poor condition for market purposes.

(d.) The definition of a minimum size limit, below which none of the kinds of fish named can be taken, is another effective protective device. It aims to protect immature and undersized fish until they breed. Thus lobsters are stated not to breed until 9 inches long—hence a 9 inch size limit has been enforced.

(e.) A size limit may be enforced on other grounds, as for instance the 10 inch lobster limit in a portion of the Bay of Fundy. The remunerative markets of Boston, U.S., would not accept lobsters under 10 inches in length, hence certain Canadian fishermen urged that this limit be specified in our laws and such a law was in certain waters carried out. The size limits for trout, black bass, and many other fish have been specified in the general interests of the fishery or in some cases, of sport.

(f.) Mesh of net regulations aiming at the same object, viz.: the liberation of small useless immature fish.

(g.) A specified distance between the slats in lobster traps or a special mesh in leaders of trap-pounds, to favour the capture, only of sizeable fish: or the naming of a minimum diameter and length as in the case of oysters in order to secure that those undersized shall not be taken.

(h.) Prohibitions enforced which forbid the taking of fish spawn, the catching, killing, or even possession, of fry and small sized fish, 'the young of any of the fish mentioned in this Act' as it is expressed in the Canadian Fisheries Act, chap. 95, A.D. 1886. While aiming to prevent the destruction of useless small fish, it also forbids practically the stocking of new waters with small fry, which might, indeed, be

1-2 EDWARD VII., A. 1902

a serious injury to such waters unless sanctioned by qualified experts. Fish and fish spawn may be taken for stocking or for scientific purposes if sanctioned by the Minister of Marine and Fisheries in Canada.

(i.) Reserves or special areas of water may be set apart for encouraging the propagation of fish and thus maintaining or improving the supply of fish. Forty or fifty specially reserved rivers, lakes and other waters, are specified in an Order in Council dated August 2nd, 1889, under Section 21 of the Fisheries Act, Chapter 95. Herring spawning reserves have been defined by special regulation off Grand Manan, in New Brunswick. In certain bays and inshore areas in Scotland, bream trawling has been forbidden, in order to preserve spawning grounds and nurseries for small fish, and other measures of this kind have been adopted in connection with different fishing methods (oyster dredges, &c.).

(j.) Improvement of fisheries and the increase of desirable fish is often sought by the withdrawal of protection of voracious species during the spawning time or the curtailment of their close season. Salmon-trout or lake-trout are thus kept in check by a close time not covering the whole period, and pike, while protected by a close season in spring in the North-west Territories, are afforded no such protection in Ontario and the eastern provinces of Canada, where they are of inferior quality and value.

(2.) Control of the fisheries, which is admittedly wise and in the public interest, is achieved in various ways such as,—

(a.) Licenses, leases and permits involving more or less exacting conditions in the exercise of the privileges conveyed.

(b.) Licenses or other permits granted with limitations so as to exclude foreigners, or prevent overcrowding or use for speculative and similar purposes. Sites or fishing locations which are undesirable and useless may be applied for to give the holder a claim after a while to some other better location which would not at first have been granted. The limitation may involve refusal to allow nets or fishing gear at particularly favourable and destructive spots, such as a projecting point at the mouth of a salmon river.

(3.) Prohibitions embracing times, places, &c., such prohibitions being,—

(a.) Restorative, as in the sturgeon fishery of the St. John River, New Brunswick, and extending over a number of years, deemed sufficient by the authorities to restore the depleted sturgeon supply. Striped bass in the Miramichi River were similarly protected, and with complete success, as was proved at the end of the third year.

(b.) Preventitive, as in the forbidding of non-tidal salmon nets in rivers; cod-trawls or bultows, which are long lines of baited hooks on snoods, and laid along the bottom, and objectionable because of their alleged destructive effects upon breeding fish, and similar prohibitions of general application.

(c.) Local prohibitions specially applicable to particular localities and districts *e.g.* pound and trap prohibitions in Manitoba and in Georgian Bay, Ontario, or the prohibition, for many seasons, of seines in Ontario, or of oyster dredges in Richmond Bay, Prince Edward Island. Salmon are not to be taken ascending a pass, a leap or in a breeding pool.

(d.) Universal prohibitions of nefarious and injurious methods, &c., which covers the use of dynamite and explosives generally, also submerged trap-nets, fish spears, and purse seines; all of which methods while effective, are too destructive to be regarded as fair and legitimate means of capture.

(e.) Special prohibitions such as that prohibiting the taking and handling of salmon spawn; but not that of trout or any other fish: a prohibition based no doubt upon the sentiment prevailing in old countries that salmon are entitled to more protection than other fish. A peculiar regulation—special even among 'Special' regulations, is that occurring in the Canadian Lobster Regulations passed in 1899, which enjoins that no one shall buy or sell mutilated lobsters or broken lobster meat. The object is to prevent evasion of the lobster size-limit regulations, it being impossible for fishery officers to detect violations if fishermen could handle wilfully broken or mutilated lobsters.

The serious nature of this nefarious procedure is being felt in the Eastern States, and the following, taken from the N.Y., *Fishing Gazette*:—

A lobster pirate is making a good revenue in the waters of the Maine by buying short lobsters at 2 cents each from the fishermen and boiling them on a steam launch

SESSIONAL PAPER No. 22b

which he has fitted up with a boiler. He breaks the tails and claws from the lobsters and has nothing to fear from the fish and game wardens, for there is no evidence to convict him. He can handle 800 pounds of meat per day, which he sells in Boston, obtaining good prices from the hotels and restaurants. He contemplates buying three more launches this summer.

(4.) Prevention of waste in the fisheries which is dealt with in many regulations such as the following :—

(a.) The capture of fish for conversion into manure is prohibited. Of course there are cases in which captured fish can be turned to no other use, especially if kept too long, and some fish like the schools of dying alewives in the great lakes are most readily utilised for oil and for fertilizers, a use still more justifiable in the case of dog-fish and other inedible species : but in many such cases 'lawful excuse' may be pleaded and would be accepted by the officers of the law.

(b.) Fishing through the ice for trout and for oysters, &c., is forbidden, not because the spawning time is in winter or because the fish are not in good condition, but because of the waste and the abuse which such fishing encourages. Many trout waters in past times were depleted by winter fishing through the ice, and in the case of oysters it seems to be impossible to avoid serious destruction of spat and small oysters, which perish, when the 'haul' is dumped upon the ice ; but such abuses are less likely to occur in summer fishing.

(c.) Grates are required in some provinces at the intake of irrigation ditches to prevent the ascent of small fish from rivers and lakes.

(d.) Bare unbaited hooks or trawls for sturgeon are prohibited in order to prevent the impaling and loss of spawning female fish, which may release themselves after being severely injured and as a rule die and are wasted.

(5.) Over-fishing (either by the method of fishing or the character of the tackle) it is sought to prevent in various ways : (a.) Limitation of length of net and number, or by specifying the number of hooks allowed on a long line, &c.

(b.) Providing for an adequate distance between nets, traps, weirs, and fixed, or moving, nets generally.

(c.) Steam tugs are in some cases forbidden to engage in actual fishing operations, and may convey crews, boats and gear, or carry the takes ; but not actually fish in such cases.

(d.) Limitation of the amount of catch or quantity to be legally shipped. This specially applies to game fish and like the laws against pot-hunting for game, has force chiefly against undesirable intruders from the United States, not true and legitimate sportsmen.

(6.) Laws to facilitate the migrations of fish to and from their feeding and breeding grounds have been enacted on the following lines :—

(a.) Obstruction to the ascent of fish to spawning resorts are forbidden.

(b.) Character and length of leaders to traps, fixed nets, &c., are defined by law. Snelt bag-nets for example have been found to have very long leaders of brush or wickerwork which render these nets too destructive.

(c.) The main channels of rivers may not be obstructed and no net shall extend more than one third of the breadth of such river course.

(d.) Fishways must be provided at dams, &c., if judged to be necessary by the authorities. The cost to be borne by the owner, unless the Minister of Marine and Fisheries consents that half be paid.

(7.) Protection of interests of fishermen and parties concerned in the fisheries is sought by special regulations.

(a.) Certain nets and modes of capture may be prohibited in the interest of those established in the industry. Thus in the Bay of Quinte, gill-nets in summer are not allowed because the nets easily rot when used there, and while a few men would use them, the majority in their own interest do not desire to do so. So also in the British-Columbia fisheries, trap or pound-nets have in general been forbidden because the great body of fishermen depended upon gill or drift-nets.

(b.) Salmon canners in British Columbia though not actually fishermen were granted a specified number of licenses, at first 40, then 25 or 20, and lastly 10 licenses, the purpose being to secure the canner from hasty or injurious action by the fishermen, who

1-2 EDWARD VII., A. 1902

might refuse to fish, and put the canner in serious difficulty at the height of the season. There is of course no necessary connection between the canning of a product such as salmon, and the capture of the fish by fishing. In some remote districts, where reliance must be placed upon Indians, unless the canner had licenses granted to him, he might not be able to operate at all. Yet a canner is not a fisherman any more than a tailor is a farmer, although woollen cloth necessitates the production of wool on the farm. In view of the canner's vested interest (his capital and outfit) he has by law been considered as entitled to fishing privileges.

(c.) In order to meet fish-buyers' needs and trade requirements, regulations have been modified as in the case of the Sunday close time which is really a Saturday close time on Lake Winnipeg for special trade reasons, and in British-Columbia the Sunday close time ends at 6 p.m., not midnight, for the benefit of the canneries.*

(d.) Similarly, regulations exist compelling one class of fishermen to desist from fishing at a specified time in order to meet the desires of another class. In southern New Brunswick certain nets in the sea, it has been urged, should by law be required to be taken up at daylight to meet the wishes of other men in the locality.

(8.) Regulations of the nature of precautions form a distinct group by themselves. The possession of illegal nets and apparatus would be a most effective measure in this direction: but being difficult to justify, is still *in futuro*: but the following are noted:—

(a.) Fishing in the mouths of rivers with seines is forbidden, and a specified distance is named in the regulations with reference to that.

(b.) Near salmon nets other apparatus, such as lobster traps, must not be set, on the ground that the fish would be deterred from entering the nets, and the hauling of the lobster traps would drive the salmon away.

(c.) Preparing to fish, like loitering or suspicious conduct under the Criminal Code, may be criminal under the fishery laws. Such precautionary measures prevents fishing operations before the opening of the legal time, or renders it impossible for one party to monopolise another's ground by taking possession prematurely and preparing to set fishing apparatus.

(d.) The presence of dynamite or explosives on board fishing vessels for the purpose of killing fish is unlawful in accordance with a recent regulation (April 12th, 1902) of a rather exceptional character.

(9.) Injurious influences affecting fish-life and closely bound up with sanitary questions, have formed the subject of much fishery legislation. Existing regulations have been framed on two lines:—

(a.) As pollutions injuriously affect fish, fish-life and eggs upon spawning grounds.

(b.) As pollutions annoy and deter migrating fish, especially when entering or passing up rivers. An offal prohibition in the Gulf of St. Lawrence was based on the alleged disappearance of the schools of cod from certain localities in Labrador on account of the offensive floating gurry or putrefying fish-waste in the water. In the Fraser River the offal from the canneries has also been regarded as harmful and therefore forbidden by law.

(10.) Regulations aiming to secure quality and purity in manufactured or prepared fish-products are included under fishery laws, though strictly speaking they belong to trade and commercial legislation.

(a.) Branding of packages and barrels with an official stamp, after strict examination and approval, has proved most effective in Scottish cured herring. The brand has given them the status they hold, as perhaps the finest quality in the markets and for trade purposes divided into several recognized grades.

(b.) Stamps on cases or cans specifying the legality of the time and season when packed. Thus Canadian lobsters, if not bearing, outside the wooden case, a tinted stamp, are thereby recognized as unseasonable and in most cases as illegal goods.

(c.) Certain customs regulations practically coincide with the objects of some fishery laws, as in the case of United States, States' salmon imported free of duty by a special concession, into British Columbia, the main consideration against such concession being that the fish, as a rule, were in bad condition, often wholly unfit to can, on account of the circum-

* The salmon must be caught before daylight in order to be available for canning operations, when the packing hands are ready on Monday morning.

SESSIONAL PAPER No. 22b

stances of capture and transit. In the crowded United States trap-nets the fish are often terribly crushed and mutilated, and after being dumped into a huge scow may lie exposed for hours to the heat of the sun in July or August, and at the close of the more or less lengthy trip, from the net to the cannery, they have wholly deteriorated, and, it is alleged, may be in a state of semi-putrefaction. No doubt canners of fish are frequently careless as to the quality of their goods, and the employees indifferent as to the excellence and appearance of the commodities they pack; but this is not always so. Many firms have a constant and strong desire to establish and to keep up a good reputation, and some go so far as to insist that the government shall step in and insist on a certain standard of quality in the fish products marketed. Five or six years ago a prominent man in the fishing industries of Lake Erie, on the United States side, came forward and strongly advocated this view. He claimed that:—‘Our law-making bodies, should pass laws that will not only foster and increase this great industry, but will also compel dealers and shippers to produce and send to the consumer, wherever he may be located, this valuable food product in the most perfect and wholesome condition possible. The people have a right to this protection and should enforce their just demands through the medium of their respective legislators.’

Some B. C. canners in 1878 volunteered to tax themselves to raise \$7,500 per annum to promote the fisheries in addition to the usual license fees, and, later favoured a Government Brand or Stamp on packages of Fraser River fish.

The sardine industry of Maine, the lobster canning industry in certain Canadian Provinces, the herring trade of the Dominion, as a whole, has suffered from the indifference of fishermen and packers respecting the quality of the products sent into the market.

Ten years ago I reported on the quality of the dried cod shipped by certain Nova Scotia firms to the United States, and I pointed out that whereas our cod realised only \$7 per quintal, the Norwegian dried cod prepared more carefully and intelligently brought as much as \$12 per quintal. Canadian cod being, however, of a higher standard than that prepared by the United States curers generally, the products of the latter rarely realising more than \$4.50 per quintal. The less fishery regulations however trench upon matters purely of trade and commerce the more they fulfil their original purpose, the protection of fish as a great natural resource of the country. Regulations such as the provincial prohibition, forbidding trespass upon premises and waters leased for purposes of fishery*, are open to criticism, as advancing beyond the proper limits of fishery legislation. Even offences against the fishery regulations forbidding the pollution of rivers and lakes may often be more effectively and appropriately dealt with by local health authorities under the Public Health and Sanitary laws.

It is not the purpose of this sketch to invade the somewhat controversial and perilous field of international law as affecting fisheries. The above summary aims, rather, to outline the main types of fishery regulations as illustrated in our Canadian laws, accompanied by a brief suggestion as to their *rationale* and basis; but it does not in any way profess to be exhaustive.

If such an outline brings out the main features of existing legislation, and if it removes any misconceptions regarding its aim and purpose rather than its form or literal expression, the object in view has been fully accomplished. It will be apparent that the ten main groups of regulations roughly tabulated, and the forty-two subdivisions into which they fall, cover the four main objects of all fishery laws:—the interests of the fish, the fishermen, the state, and of foreigners with which we have relations on fishery matters. These four objects embrace the essential aim of all fishery legislation; but its method is very diversiform, as has been indicated. The tendency has been to multiply the detailed forms of fishery regulation chiefly in response to supposed local peculiarities and special conditions of the fishermen or the fish. The bane of fishery regulation is complication and diversity in local detail.

There is no course, in the long run, more wise and more beneficial than a resolute opposition to hasty, ill-considered and facile multiplication of detailed fishery regulations. If carried to excess it nullifies regulation altogether, for no laws can be enforced, which apply only in restricted areas, or for petty reasons. If a fish for example can be

* Rev. Statutes of Ontario c. 32, s. 26.

1-2 EDWARD VII., A. 1902

legally caught in one area at the same time that it is prohibited in the next area, poaching will go on all the time, and any illegal fish detected in one district will be declared to have been taken in the other district. Fishery laws, the fewer and simpler they are, will be all the more effective and beneficial for the reason that they are more easily understood, and that there is less excuse for wilful violation. Canadian fishery legislation is all based on the Fisheries Act, Chapter 95 (1886) which consists of 22 sections and 68 subsections. Under the British North America Act it was held that the Canadian Parliament had power to enact these Statutory Regulations, though, as already pointed out, certain of the clauses are now declared to be invalid and *ultra vires*. Since the date of the statute, 1886, numerous amendments and additions have been made, at least four new sections (consisting of 22 subsections) have been added, and 5 other subsections appended, while 2 new sections (one embracing 9 subsections) have been substituted for old ones, and 8 old subsections in addition, replaced by new ones. One section of the Act has been repealed totally. Few fishery regulations enacted in recent years are statutory, no less than 309 Orders in Council embodying new fishery regulations have been passed since 1890, such Orders in Council having under section 16 of the Act (1886) the force of the Act itself. The reduction in number and simplifications of this formidable series of legislative enactments is most desirable, but a useful and inclusive body of regulations can only be framed, after deliberate and exhaustive consideration of the fisheries as a whole. Hasty and ill-considered legislation is at once a danger and an injury, as Mr. C. E. Fryer, one of His Majesty's Inspectors of Fisheries, said at the Great Fisheries Conference in London, July 27th, 1883 :—' One of the greatest evils to which any industry can be subject is that of spasmodic legislation—legislation framed to meet a popular cry of the moment. Among a certain class of people whose view is bounded by the horizon of their own particular standpoint, a demand for legislation is heard on every imaginable pretext.'

Fishing laws are too serious in their effects, direct and indirect, upon the fishery resources of the country, the welfare of the fishing population, and the interests of the state to allow of ill-informed, one-sided or hasty formulation of regulations and injudicious or blindly rigorous enforcement.

